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ORIGINAL ARTICLES.

REPEATED OPERATIONS ON THE SAME NERVE FOR CHRONIC FACIAL NEURALGIA.

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IN an article published elsewhere, I called attention to the fact that repeated operations on the same nerve will give, after each operation, a prolonged period of relief to patients suffering from facial neuralgia. Further experience has thrown additional light on the subject, and clearly indicates a coming advance in neural surgery.

The causes of trifacial neuralgia are generally peripheral, though a few cases originate in the brain itself. The opinion is gaining ground that in superior and inferior maxillary neuralgias the point of origin is most frequently a decayed tooth, but that various injuries and diseases of the maxillary region may also be causative. Inflammation and ulceration around a tooth, or some other irritation, set up a neuritis in the corresponding nerve-twig. Generally this subsides without causing permanent injury, but in a few cases, for reasons at present unknown, the neuritis becomes progressive and advances to the main nerve-trunks. In the lower jaw, for instance, the inflammation reaches the main inferior dental nerve, and with the well-known obstinacy of neuritis proceeds backward along the dental canal, emerges from the foramen on the inner side of the ramus, creeps up the inch and a half of nerve from that point to the skull, and follows the trunk of the nerve into the foramen ovale, where it causes disease in the great semilunar ganglion just above the foramen and inside of the skull. Many cases seem to stop here permanently, causing frightful pain, referred to all of the three trunks of the trifacial, but not entering the brain. A few, however, follow the fifth nerve into the medulla oblongata, and set up a variety of cerebral disorders. In one case under my observation, the sight of both eyes was lost, either from the disease extending to the roots of the optic nerves, or to the visual centres of the brain itself. However, as previously stated, only a few progress to this extent. In the great majority of cases the inflammation seems to cease at the semilunar ganglion, causing violent pains, referred primarily to the inflamed branch, but radiating in a less degree to the other two trunks. To the patient the pain seems peripheral, though the real cause lies deep. In bad cases the paroxysms come on with violence—sometimes every fifteen minutes—with intervals of ease.

The old surgeons, like the patients, located the disease at the place where the pain seemed to be, and to this day neuralgic teeth are often pulled out in the vain hope of removing the cause of suffering.

In cases of neuralgia of the inferior dental nerve, the elder Gross advised subcutaneous section of the trunk where it emerges from the anterior mental foramen. Experience soon showed the futility of these and similar methods, and the French surgeons advocated the idea that the points of irritation were to be found in some of the numerous bony canals and foramina through which the branches of the fifth nerve pass, and instructed their pupils to resect these nerves on the proximal side of the bony canals. This proved better, and many brilliant cures, some permanent and others temporary, were thus effected. The majority of cases, however, relapse, when if a section of nerve long enough to prevent reproduction has been removed, surgeons abandon operative treatment as hopeless, unless there is enough of the stump of the nerve left to admit of a second resection.

Just here accident favored us. In a number of instances in searching for the shortened stump of a previously-resected inferior maxillary nerve, the operation resulted successfully, though not a particle of nerve-trunk could be found in the tissue removed. This, of course, led to thought and to action.

The following case is a good example:

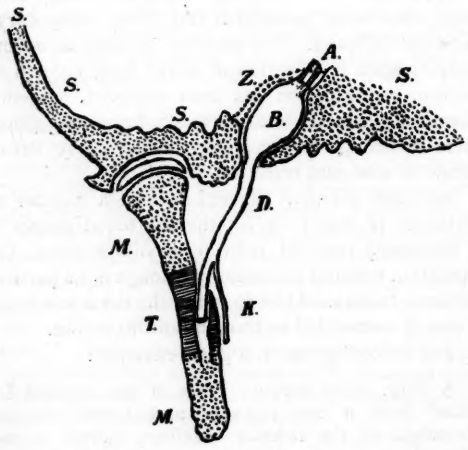
A lady, about seventy years of age, applied for relief from a characteristic and severe chronic neuralgia of the inferior maxillary nerve. I trephined the ramus of the jaw, and picking up the trunk of the nerve with a pair of stout forceps, slowly wound it on the beak of the instrument, and broke it off some distance upward toward the point of exit from the skull, bringing away about an inch of the nerve.

The parts healed readily, and the patient was free from pain for about a year and a half. A relapse then occurred, and she begged for another operation. Though unable at first to see that any result could be expected from an operation when the nerve was out of reach, it occurred to me that the broken end of the nerve-stump must necessarily be attached to the cicatrix of the old operation, that at least I could thoroughly stretch it, and

that this might be useful just as nerve-tension is in Nussbaum's operation. I therefore operated again, cutting along the line of the old scar to avoid hæmorrhage and shock. The hole left by the trephine was closed by cicatricial tissue. With a tenotome I carefully separated the cicatricial disk from the edges of the bone and drew it a little outward, then seizing it with strong forceps I forcibly drew upon it, and slowly twisted its internal prolongation until it came away. No nerve-tissue could be found in it, but the deeper part must have been attached to the nerve-stump, and hence the latter must have been strongly stretched. There was neither shock nor hæmorrhage. The patient was again relieved, and remained free from pain for a year or two. Again she relapsed, and was again restored to comfort by a repetition of the procedure. She was thus relieved four times during a period of six years, though no nerve-tissue was exsected except at the first operation.

Similar cases have repeatedly occurred in my experience, and I think that many other surgeons have unintentionally accomplished the same thing, while pulling on the cicatrices of old operations in the hope of removing more of the stump. The mechanism of the procedure is probably as shown in the accompanying cuts.

FIG 1.



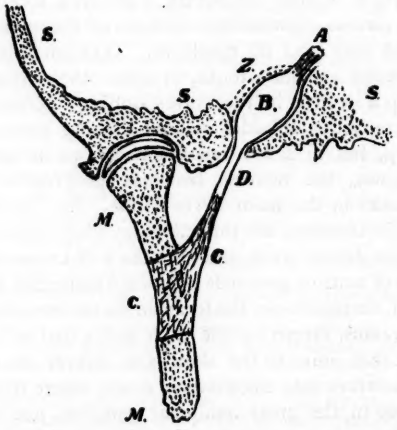
S, S, S, S. Part of base and left side of skull, cut transversely through the foramen ovale. *M, M.* Ramus of the jaw, cut nearly in the same direction. *A.* Fifth, or trifacial nerve, entering the semilunar ganglion. *B.* Semilunar ganglion, bound down by a thick roof of dura mater, indicated by the double dotted lines *Z*. *D.* Inferior dental nerve passing down through the foramen ovale to enter the foramen in the ramus at *T, K. K.* The myloid branch. *T.* The horizontally-shaded portion represents the part of the bone removed by the trephine.

Fig. 1 represents a transverse section of the left half of the base of the skull seen from behind. The line of section runs transversely through the foramen ovale and the articulation of the jaw. The ganglion *B* is viewed edgewise from behind, so that the ophthalmic and superior maxillary branches, which are in front, are not seen, but the inferior dental nerve *D* is shown, passing from the foramen ovale to the posterior dental foramen of the lower jaw, between *T* and *K*, a distance of about an inch and a half. *M M* is a section from the condyle of the jaw downward and a little forward to the bottom of the ramus. The horizontally-shaded portion *T* represents the part usually removed by the trephine.

In making a resection of the nerve, we, of course, remove the button of bone and drag the nerve out by avulsion, or divide it high up with scissors, and then draw it out. As the sheath of the nerve has countless attachments to the connective tissue, which are lacerated in dragging it out, we leave the track of a future cicatrix, extending from the end of the nerve-stump to the external wounds. In healing, the foramen made by the trephine is not closed by bone, but by a disk of cicatricial tissue adherent to the bone at its edges, and extending in a conoidal form to the divided end of the nerve.

The action of the secondary operations is doubtless as follows: The disk being separated from the bone and dragged out by force, powerful traction is made upon the attached stump of the nerve *D*.

FIG. 2.



A. Fifth nerve. *B.* Semilunar ganglion. *D.* Stump of the inferior dental nerve. *C, C.* Cicatrix filling the opening made by the trephing, and extending to the cut end of the nerve *D*. The cicatrix *C* has not the smooth, well-defined outline shown in the figure, but it constitutes a mechanical connection between the disk occupying the trephine hole and the cut end of the nerve.

In short, it produces vigorous nerve-stretching, which acts directly on the nerve-trunk itself, and effects mechanical changes in the ganglion *B*, so that in principle it is simply Nussbaum's nerve-stretching operation.

The possibility of thus repeatedly curing after relapse is of great practical value, and seems to be not generally known to authors.

Now, as nerve-stretching without resection often effects prolonged cures, it is a fair question whether resection of the nerve is necessary at all, since one might uncover the trunk, either by trephining or by the operation through the mouth, and simply stretch the nerve, and one could repeat the stretching as often as relapses occurred.

Another suggestion naturally arises. It is probable that the seat of the inflammation in chronic cases is almost always in the semilunar ganglion, and that extirpation of that organ would effect a permanent cure; but as the ganglion is situated within the cranium and lies close against the internal carotid artery, no one has yet shown us a safe method of removing it. The operation could be performed without great risk, as follows:

First raise the tissues from the outer surface of the ramus, and divide that part of the jaw below the middle, along a line commencing at the junction of the front edge of the ramus with the body of the bone and running downward and backward. Then forcibly turn the ramus outward, so as to expose the parts within it. Identify the nerve, and follow it upward and inward to its exit from the foramen ovale. A small artery enters the foramen from below, which might require torsion. Then with suitable instruments enlarge the foramen sufficiently to admit a very small curette, or other instrument capable of breaking down and removing the substance of the ganglion. The latter is roofed in above by a very strong covering of dura mater, separating it so effectually from the brain, that the convolutions need not be wounded. In the figures, the double-dotted lines *Z* indicate this covering. Along the inner border of the ganglion the internal carotid artery lies in pretty close relation, so that great care would be required in that situation. The centre of the ganglion lies nearly in the direction of a straight line drawn from the bottom of the sigmoid notch of the ramus upward and inward through the centre of the foramen ovale. After the operation, the ramus could be turned down again and wired to the body of the bone. The operation should, of course, be done antiseptically, and drainage secured at a convenient point. In those very obstinate and severe neuralgias of the fifth nerve, which render existence almost unbearable to the patient, I think this operation would offer a probability of permanent cure, and be entirely justifiable.

No. 6 SIXTEENTH STREET.

Artificial Production of Inguinal Hernia.—It is said that in Russia the Jews sometimes produce inguinal hernia in themselves in order to avoid military service. An instrument resembling a glove-stretcher is used, and by means of it the inguinal canal is gradually dilated.

AN INVESTIGATION OF THE COMPARATIVE FREQUENCY OF TYPHOID FEVER IN THE CITY OF READING AND THE COUNTY OF BERKS.

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FIFTEEN years ago, while riding with a physician in an adjoining county, on his way to a patient, he pointed out a house with a remarkable history. He said that he had practised medicine in that locality for thirty years, and during that time the occupants of the house had changed every two or three years, that he had been attending physician to all the families who lived in the house during that time, and that every family had had typhoid fever while there. This remarkable story seemed to me proof that there was a local cause for the disease about the house, and impressed me with the idea that local causes for typhoid fever might generally be found, if properly sought. It also led me to question whether, if the cause of typhoid fever could cling to a farmhouse so long, reproduce itself so often, and poison so many families in succession, such a place could not become a centre of infection for people who, although living at a distance, consumed some of the food-products of the farm, in which the germs of disease might be transported.

With this question in mind, I made a number of observations during the years that have since elapsed, the results of which led to the present investigation of the comparative frequency of typhoid fever in Reading and the surrounding country. The field of this investigation embraces the city on the one hand and the rural districts of the county of Berks on the other. The year 1889 was selected because it presented a minimum amount of the disease, in both the city and county. The data upon which this report is based were obtained by mailing a series of questions to every registered physician in the city and county. The work was unfortunately delayed by the appearance of the "grippe" at the time that the questions were sent to the physicians in the county. In consequence of this, some were disabled and others so busy that replies were obtained with difficulty, and from some none at all were received because so long a time had elapsed before they could give the matter attention, that, having kept no record of cases, they could not give definite answers.

Of the 97 physicians who practised in Berks County during 1889, positive and definite answers were received from 70. These gentlemen reported 412 cases. Supposing the 27 who did not report to have had the same average number of cases, they would represent 159 cases. To these should be added 18 cases, which occurred just outside the city limits, and were attended by city physicians. The total for the county then would be 589 cases.

In the city there are 71 registered physicians, excluding specialists who do not attend fever cases. Of these, 66 reported 208 cases, and 5 did not report. Giving the latter the same average number of cases as those who reported, they would represent 16 cases. In addition to these there were treated in the two hospitals 16 cases which originated within the city limits, making a total of 240 cases for the city.

The population of Reading, as shown by the last census, was last summer 59,000, and that of the county 76,000; and for my purpose it may be assumed that the proportions were the same last year. The city, with 59,000 inhabitants had 240 cases of typhoid fever, or 1 case for every 246 residents; while the county, with 76,000 inhabitants, had 589 cases, or 1 for every 129 residents. In other words, there were in the city 4.07 cases for every 1000 inhabitants, and in the county 7.75 cases for every 1000.

Although my previous observations led me to believe that typhoid fever was more prevalent in the county than in the city, a ratio of nearly two to one is entirely beyond expectation. Indeed the difference is so striking that in the absence of corroborative statistics from other sources—and I know of none to offer—it may inspire in the reader doubts of the correctness and truthfulness of the report; and hence it may be well to state in detail the characteristics of the field embraced by the investigation, and the method by which these results were obtained.

Every physician practising in the county was addressed by letter or in person, and was requested to furnish a list of the cases of the disease he had attended during the year in his own field of work, excluding those that he saw only in consultation. Among these physicians there are a number who live just beyond the borders of Berks County and yet see many patients in the county, and others who reside in the county, but do much of their work outside of its limits. These physicians were requested to report only the cases which occurred within the county lines. The division between the city and county was made in the same way. Cases which occurred outside of the city limits, although attended by city physicians, were assigned to the county. In the records of both city and county, cases occurring in visitors or new residents, who arrived within thirty days before the appearance of the disease, were not counted.

The geological features of the county are such as would largely prevent the transmission of disease-germs through the water-courses from adjoining districts. The eastern and western borders of the county are almost on a line with the water-sheds of the Delaware and Schuylkill and the Susquehanna and Schuylkill, respectively; and the northern boundary being the summit of the Blue Ridge, the surface water of the other side reaches the Schuylkill before reaching the county.

The water-courses of the southern part of the county flow in an outward direction to empty into the Lehigh, Susquehanna, and Schuylkill Rivers. The Schuylkill, flowing in a southeasterly direction, divides the county into two almost equal sections, carrying with it the drainage of the lower Schuylkill coal-field, but its water is not used for domestic purposes either in the county or city.

The water-supply of Reading is derived from springs and brooks which arise in the mountainous districts immediately east of its boundaries. The subsoil of these districts is composed of Potsdam sandstone and Laurentian gneiss, and the water is unsurpassed for both domestic and manufacturing purposes. The section from which it comes was singularly free from typhoid fever last year, and the physicians who are familiar with the region say that the disease is very infrequent there at all times. Dr. M. L. Bertolette, of St. Lawrence, whose practice extends into the section that supplies the largest of the three storage reservoirs—an area of six and one-half square miles—states that in six years he has not seen a single case of typhoid fever there, while in the valley below there have been some cases every year.

Such testimony tends strongly to exclude our water-supply from the causes of the disease in the city, and it is corroborated by the entire absence of evidence that a single case arose from the use of the city water. On the other hand, a large number of cases, which occurred among the employées of a cotton mill, were traced directly to the use of water from a well near the mill. The exact number of these cases could not be determined without more time than I could give the matter; but it is safe to say, from information given by some of the attending physicians, that there were more than twenty-seven.

The varying geological features of the different sections of the county have an important bearing upon the distribution of this disease. The shale formations furnish a much larger proportion of cases than the limestone. This is undoubtedly owing to the greater porosity of the subsoil in the former. In the shale sections the surface is more undulating than in the limestone, and nearly all the dwellings are located in the depressions near springs. Where there are no springs, and wells are necessary, water is usually found quite near the surface. The house being near the water, the barn, privy, and other outbuildings are of necessity placed upon higher ground. Then, with a porous, sieve-like soil between the well or spring and these buildings, and the natural ten-

dency of the water which is absorbed by the higher ground to percolate to the lowest point, it becomes apparent that the germs of the disease, once thrown into a cesspool, may for a long time vitiate the water and infect successive occupants of the dwelling.

While the owners of shale lands have not recognized the evil sanitary effects of the looseness and permeability of their subsoil, they are fully aware of its blighting effect upon their crops. Some years ago an intelligent owner and occupant of a large farm in a shale region complained to me of the disadvantages under which he labored as compared with his more fortunate neighbors on the limestone lands, just a mile south of his own. He said that they, with the same labor and expense, raised much larger crops than he could. Upon being asked why he did not use fertilizers and thereby improve the soil, he replied that he had tried them, but found that while on limestone land they improved the crops for several seasons, on his the next rain carried them down into the earth far beyond the reach of the growing crops. The inference to be drawn from this farmer's statement for my purpose is, that if his spongy subsoil imbibed the fertilizers with the next rain, it would do the same with anything else that water would bring in solution to it.

In the limestone areas there are fewer springs and their flow is usually larger, and varies less in the wet and dry seasons, indicating that they are draining a larger surface, and hence that their water comes through the earth from a greater distance. Moreover the clay which overlies the rocks, being more compact, is a better filter than shale. Then again, the wells are deeper, it being a common thing to find them from thirty to fifty feet deep in limestone land.

Typhoid fever was most prevalent in the shale soil of this county, not only last year, but for a long time previously. I observed the fact and spoke of it before the Berks County Medical Society twelve or thirteen years ago. A similar observation has been made, I believe, by Pettenkoffer, of Munich, on the occurrence of the disease in the vicinity of that city.

The correctness of the primary reports upon which this observation is based is open to question, and, of course, depends upon the truthfulness and professional ability of the physicians who kindly made them.

The report from the city is as nearly correct as it can be made without the aid of every physician. To ascertain whether any of the five who did not reply to my inquiries reported deaths from typhoid fever, I examined the records of the Health Office. The name of one of the five appeared, with one case, and all the other deaths from the disease were accounted for by those who sent reports.

It is possible, then, that the five physicians from whom I had no response did not have the average number of cases with which they were credited, and that consequently the whole number in the city is a little less than has been stated.

It is a matter for regret that the investigation of the county could not be made as complete as that of the city. However, the errors which do exist are probably in favor of a larger number of cases than this report shows.

Of the twenty-seven physicians who have not responded, and who were credited with the average number of cases in making up the figures, twenty-one reside in the old slate and new red sandstone formations, in which the disease is more prevalent than in the limestone belt, and probably they had more than the average number, which would make the figures of the report too low. Moreover, I have not included in this report an outbreak of the disease which occurred in one of the school districts between Kutztown and Virginsville, in the old slate formations. This outbreak was supposed to have originated from well-water used by the school, and included a large number of cases. Most country schoolhouses are not supplied with wells, but the water is usually brought from the nearest dwelling, so that the scholars are exposed to the morbific influences which may be present in the dwellings. The school in which the outbreak occurred is situated between the residences of a number of physicians, whose practice extends throughout the district, all of whom, unfortunately, failed to report their cases. Full accounts of this endemic would have added considerably to the number of cases in the county.

In a collective investigation like this the question of the correctness of the diagnosis of the cases reported is worthy of careful consideration, but it can be answered only in the most indirect manner. Other things being equal, the diagnosis will be correct in inverse proportion to the number of families from which a given number of cases are collected, because the whole family is usually more or less exposed to the poison which caused the disease in one of its members. With this idea in mind the physicians who took part in the investigation were requested to state the number of families affected and the number of cases that occurred in each family. Unfortunately, the reports received are so imperfect that only a few can be used. Only those who had more than ten cases each have given full replies to the questions. Their figures are exhibited in the table on the next page.

It is seen that 8 country physicians return 166 cases from 83 families—an average of 2 to each family—while 7 city physicians return 100 cases from 77 families, an average of 1.3. The probabilities of correct diagnoses are then, from this point

of view, decidedly in favor of the country. These figures also indicate either that country people are more susceptible to typhoid fever than are residents of the city, or that the poison which produces the disease is more virulent, or continues its activity longer in centres of infection in the country than in the city.

COUNTRY.			CITY.		
	No. of families.	No. of cases in each family.		No. of families.	No. of cases in each family.
Physician, No. 1	18	1	Physician, No. 1,	4	1
	5	2		1	2
	3	3—37		1	4—10
" No. 2	3	1	" No. 2	10	1
	1	2		1	2—12
	2	4	" No. 3	6	1
	1	10—23		2	2—10
" No. 3	4	1	" No. 4	3	1
	1	3		3	2
	1	5—12		1	3—12
" No. 4	12	1	" No. 5	11	1
	1	2		1	5—16
	1	11—25	" No. 6	18	1
" No. 5	1	2		1	2
	1	3		1	5—25
	1	9—14	" No. 7	11	1
" No. 6	7	1		2	2—15
	4	2			
	2	3			
	1	5—26		77	100
" No. 7	3	2			
	2	3			
	1	4—16			
" No. 8	4	1			
	1	2			
	1	3			
	1	4—13			
	83	166			

Inasmuch as it has become fashionable in the large cities to blame the plumbers for the spread of typhoid fever, an effort was made to ascertain whether indoor water-closets had any bearing upon the occurrence of the disease in Reading, although the conditions are not the same, as this city has no system of house-sewerage. The bath-tubs and water-closets empty into wells, usually from ten to thirty feet from the houses, so that each building has its own sewer, and cannot through bad plumbing be affected from adjoining ones. But, the germs of the disease having once reached the cesspool of one of these houses, there is no reason why they should not find their way up the pipes and into the house as easily as if they had to start from a common sewer-pipe. The only difference, then, between a house with modern conveniences in Reading and one in a city with a common house-sewerage system, is that in the former typhoid fever must at some time have been on the premises before the house could be infected through bad plumbing, while in the latter its first appearance might be due to imperfect connection with a common sewer. The reports of the physicians upon this point were so unsatisfactory that no calculations could be based upon them, and information was then sought in the contagious-disease record of the Health Office. There the surprising fact was discovered that only 66 of the 240 cases of the disease which occurred in the city were recorded. Of these, only nine occurred in houses that pay water tax for indoor closets, and, of the nine, six were in one family, in a new house, in which typhoid fever had not previously existed, and the disease was undoubtedly due to the use of milk from an infected dairy. In the three other cases no cause outside of the dwelling has been discovered, and it is therefore possible that they may have been due to bad house-drainage. It is known that one case did arise in connection with a leaky sewage-pipe in a hotel.

Admitting that the three cases were due to this cause, we have 3 out of 66 cases, or 1 in 22. The whole number of houses in the city is 15,000, and of these 1471 have indoor water-closets—about 1 in 10. The houses with water-closets, then, show less than half as many cases of the disease as those without them.

The sources of food-supply were not examined for causative relations to the disease, except in a few cases to which the attending physicians invited attention, because the time for such an undertaking could not be spared. Inquiry in these few instances led to the discovery that eleven cases, in various parts of the city, could be traced to the use of milk from a dairy farm on which the disease had occurred during the year. There were a few other cases in which it was suspected that the milkman brought the disease, but for the reasons stated they were not scrutinized. There is, however, ground for believing that in many more instances the cause could have been traced to the source of food-supply.

After deducting the 11 cases which were due to the use of contaminated milk, and the 27 due to the use of the well-water at the cotton-mill, there remain of the 240 cases which occurred in the city 202 of which the cause is unaccounted for—an average of 3.43 per 1000 inhabitants. It is possible, but not probable, that these 202 cases arose from causes which were confined to the city. Nearly all of them occurred in houses without indoor water-closets, which, so far as infection from sewage is concerned, are in the same condition as rural homes, the cesspools being some distance away. Actually, they are under better sanitary conditions, because, in the city, cesspools must be twenty feet deep, while in the country they are frequently only a few feet in depth, and in many instances are open below and permit the ingress of fowls. Moreover, in

this city it is not possible for the cesspools to communicate with the water-supply as in the country. Does it not seem likely, then, in the absence of evidence to the contrary, that the *materies morbi* in these cases was brought here from the country in the food?

There are a few old wells still open in various parts of the city, and a small number of people use water from them during the summer. It is possible that some cases of the disease arose from the use of this water, but the matter was not examined sufficiently to warrant an opinion.

These investigations were made with as much care and labor to find the truth as it is possible to bestow by one who is otherwise engaged, and the writer believes that they will compare favorably with the best work of this kind, and that in accuracy of detail they are far superior to statistics furnished by the health offices. A large part of the spare time of the writer and an assistant was given to the work since the beginning of 1890.

What are the inferences to be drawn from it?

First, that the conditions are more favorable in the country than in the city for the propagation and dissemination of the microbe which causes typhoid fever, and that in Berks County typhoid fever is distinctly a rural disease. This inference is supported by the facts that the disease is more than twice as frequent in the country as in the city; that no food-material is taken from the city into the country which is not equally distributed in the city, and which would not produce like effects in both places; that varieties of food are brought from the country to the city which are not obtained from other sources, and that the disease has followed the distribution of some of them in the city, especially the milk; that the consensus of opinion in the profession is, that the germs of the disease are in nearly all cases imbibed with food and drink; that the conditions necessary for contamination of the food and drink in the city exist in the lowest possible degree; and that water, which is in everything we eat and drink, and is everywhere present, and is probably the principal carrier of the germs of the disease, is more frequently polluted in the country than in the city.

Second. That preventive measures against typhoid fever cannot be successful in cities until a board of health is established in each county, the authority of which shall extend over the whole county, and which shall have a number of active representatives in various parts of the county who will report cases of contagious disease and search for their causes.

The necessity of such a board of health is illustrated by an incident which came to my notice last year. A lady told a doleful story of one of her market-women, who said that she had that day one daughter lying dead from typhoid fever and another at the point of death. And yet this woman came to market with butter, cheese, and other manufactured articles in which was water from her spring or well which in all probability spread the disease in her family.

This is only one of many similar occurrences which inquiry would discover in the markets of Reading.

Third. The Board of Health of the city of Reading, with its present powers and its present methods of work, is of no practical use, beyond being a convenience to the citizens for the abolition of open and glaring nuisances, and the tabulation of births, deaths, and marriages. The contagious-disease records, so long as only one case in four is recorded, are utterly useless for any purpose. It must be said, however, that this fault lies not with the Board, but between the laws which created it and the physicians who are expected to report cases of contagious diseases but fail in three cases out of four. The error in the law lies in its failure to compensate physicians for making out certificates of disease, and there is no reason to expect physicians to do this work carefully without remuneration. A small fee paid for such service would undoubtedly make it much more efficient, but it should be small, to prevent abuse in the other direction. To guard against the issuing of false certificates, the signature of the head of the family might be required in addition to that of the attending physician.

Fourth. All boards of health should possess sufficient money, power, and inclination to push their inquiries beyond mere tabulation of cases of disease; and unless they search for and remove causes of disease their work is of very little value. There are no reasons why an agent of the Board of Health should not follow every case of contagious disease, and examine its environment in every feature—the water- and food-supply, the source of the milk, the condition of the cesspool, and everything which might possibly affect the well-being of the invalid. If this were done, our boards of health would, in all probability, in a few years be able to trace every case of contagious disease to its origin, and, of course, to recommend successful means of prevention.

THE CHEMICAL RELATION OF OZONE AND HYDROGEN PEROXIDE.

BY CHARLES HENRY BROWN, M.D.,
OF NEW YORK.

I HAVE been much interested in the study of ozone and in the investigation of its chemical nature, and have recently, with the aid of Dr. Stanley Wyndham, endeavored to unravel the enigma of why peroxide of hydrogen, H_2O_2, should generate

O_3. This was suggested to me by recent articles on the subject, especially those of Drs. Gibier[1] and Aulde,[2] who both associate ozone with peroxide of hydrogen. Another reason which prompts my presentation of the following chemical *résumé*, is that both ozone and hydrogen peroxide in various combinations are destined to play important, yet different, *rôles* in therapeutics, and it is well to have a correct and practical idea of the nature of these compounds.

"The wonderful properties of ozone are but partly understood; like some other powerful agents, it cannot be safely handled, but it gives great promise in the future. The statement has been made that ozone is but an allotropic form of oxygen, and that it is identical with hydrogen dioxide (the subject of the present article), and for all practical purposes, from a therapeutic standpoint, they may be considered substantially the same." (Aulde.)

"It is worthy of notice that water charged under pressure with fifteen times its volume of pure oxygen has not the antiseptic properties of peroxide of hydrogen. This is due to the fact that when the peroxide is decomposed nascent oxygen separates in that most active and potent of its conditions, next to the condition or allotropic form known as ozone. Therefore it is not illogical to conclude that ozone is the active element of peroxide of hydrogen." (Gibier.)

It is considered that oxygen is capable of three allotropic modifications, viz.:

O_2, ordinary (unactive) oxygen; O_3, ozone; and O_1, active oxygen.

The latter form of oxygen (O_1), which only exists in *status nascendi*, is the most powerful oxidizing agent known, and is capable of combining with inactive oxygen (O_2) and forming ozone (O_3). Ozone is also a powerful oxidizer, in fact not much less so than O_1, and as it is only formed in the presence of O_1, a distinction is in many cases difficult, and the chemical action is often ascribed to ozone, as for instance, as stated above, in the case of hydrogen peroxide (H_2O_2), the oxidizing agent of which is not ozone (O_3), but nascent or active oxygen (O_1).

The following distinctions, arranged according to Baumann,[3] still further show the difference between ozone and hydrogen peroxide, and the relation that O_1 bears to each.

1. Active oxygen combines with inactive oxygen forming ozone, which is easily demonstrated in all cases in which its formation is not inhibited by the presence of easily-oxidizable bodies.

2. Active oxygen oxidizes water, and forms hydrogen peroxide. This does not take place when ozone acts on pure water (*vide* the following experiment).

3. Active oxygen oxidizes the nitrogen of the atmosphere forming nitrous and nitric acids. Ozone has no effect on nitrogen.

4. Active oxygen oxidizes carbon monoxide to carbonic acid; this is effected by ozone.

Positive (O_1) and negative active oxygen (O_1) act essentially in a similar manner. It is certain, however, that the action of hydrogen peroxide (H_2O_2), whose oxygen according to Schonbein is positive, is much less intense than that of ozone, O_3. Ozone is a gas, hydrogen peroxide a liquid, and this fact alone necessitates a different action of the two toward various bodies. In both (apart from the positive or negative electricity, a difference which may be safely assumed) the oxidizing factor is O_1; in the one compound bound to inactive (latent) water, in the other to inactive oxygen. The following tests may suffice to prove the different action of H_2O_2 and O_3 on other bodies, and also serve as a distinction between the two compounds.

If an aqueous solution of a basic lead salt[1] be added to a solution of hydrogen peroxide a reddish-brown precipitate, accompanied by an evolution of gas, is formed. Even in very dilute solutions the browning of the precipitate is perceptible. With aqueous solutions of basic copper salts, a black precipitate of copper peroxide is obtained which soon turns bluish-gray, and finally becomes light-blue cupric hydroxide; if the solution of the peroxide of hydrogen is concentrated an evolution of gas may also be observed. Ozone, on the other hand, effects no change in these two reagents, neither is there any evolution of gas.

A further distinctive reaction is given by chromic acid. If a few drops of a solution of the latter and some ether are added to a solution of hydrogen peroxide, and well shaken together, the solution assumes a beautiful blue color, owing to the formation of perchromic acid, and on allowing it to stand the color is taken up by the ether and a deep blue layer separates out. Even in very dilute solutions of peroxide the blue coloration is still distinctly discernible. Ozone in gaseous form or in solution does not affect the chromic acid.

It has been stated that a solution of ozone in water resolves itself in time into peroxide of hydrogen. To prove that this is not the case, I tested solutions of ozone which were six weeks old, and which had been exposed to the air several times. They still gave all the ozone reactions, but were not affected by chromic acid; if the slightest trace of hydrogen peroxide had been formed, its presence would have been shown by a blue coloration.

Permanganate of potassium is immediately discolored by peroxide of hydrogen, brown oxide of manganese being formed, accompanied by a strong

[1] Peroxide of Hydrogen and Ozone. Paul Gibier, M.D. THE MEDICAL NEWS, October 25, 1890, p. 416.

[2] Hydrogen Dioxide—A résumé. John Aulde, M.D. New York Medical Journal, 1890, p. 711.

[3] Zeitschrift für Physiol. Chemie, vol. v.

[1] Gawalowski: Rundschau, 1889.

evolution of oxygen gas; whereas, if ozone is passed through a solution of permanganate of potassium, the latter remains unchanged.

Very interesting is the action of ozone on egg-albumin. If a saturated aqueous solution of egg-albumin (having a very slight yellow color) be treated with ozone, it rapidly assumes a golden-yellow coloration, very similar to the color of undiluted egg-albumin. This ozonized albumin does not coagulate, even when heated up to the boiling-point.

If the same aqueous solution of egg-albumin be treated with hydrogen peroxide, the color is not changed, a strong evolution of gas is observed, and on the application of a slight degree of heat the albumin is coagulated.

It has been established by various investigators that the molecular formula of ozone is O_3. Andrews and Tait[1] demonstrated that ozonization is accompanied by a change of bulk. In the formation of ozone three volumes of oxygen are condensed to form two volumes of ozone, which, when heated, increase in bulk to form the original three volumes of oxygen; whilst, when acted upon by potassium iodide, one-third of the ozone is spent in liberating the iodine, and the other two-thirds go to form ordinary oxygen, thus: $O_3 + 2KI + H_2O = O_2 + I_2 + KOH$. This supposition has been proved to be correct by Soret,[2] as follows: Many essential oils, such as turpentine and oil of thyme, were observed by Schonbein and others to possess the property of absorbing ozone without decomposing it, and Soret showed that the diminution in volume which takes place on the absorption of the ozone by these oils is exactly twice as great as the increase of volume observed when ozone is decomposed by heat.[3] A series of three experiments proved that for every 19.3 c.c. of ozone absorbed by the oil, 9.47 c.c., instead of the exact number, 9.65 c.c., of common oxygen were formed on heating. These various experiments conclusively prove that dry oxygen is converted into an allotropic modification possessing the molecular formula O_3 (ozone), three volumes of common oxygen having been condensed to two volumes by the formation of ozone. In regard to its volume, the molecule O_3 simply obeys the law of Avogadro,[4] by occupying the space of two atoms of H, consequently $3O_2 = 2O_3 = 2(O_2 + O_1)$. In a given quantity of oxygen there is only a small proportion transformed to O_1, a number of molecules of O_2 remain unchanged, and to these the molecules of O_1 attach themselves and form O_3. As, however, the union is effected with but little force, the newly-formed molecule O_3 contains two firmly-bound atoms and one loosely-bound atom, and this latter one can act chemically in a similar manner to a free atom. In oxygen, O_2, each atom is doubly bound to the other O=O; in ozone each atom is bound singly to the other, and if a reductive body comes into contact with this lightly-bound molecule, the action is much quicker and more intense than with a molecule of ordinary oxygen. It is due to this single atom O_1 alone that this great activity takes place; O_2 alone, for instance, is incapable of oxidizing indigo to isatin, but O_1 (as contained in ozone) accomplishes this in a short space of time.

$$C_8H_5NO + O_1 = C_8HN_5O_2.$$

It is right to conclude that hydrogen peroxide and ozone are different compound bodies, and that both depend for their great activity upon the availability of the unsaturated atoms of O_1. And the question as to their differences relates to the varying availability of these unsaturated atoms, no matter whether charged with positive or negative electricity, or whether the O_1 is derived from O_3—H_2O_2—Mn_2O_7, or elsewhere.

Ozone, up to the present time, has played but a slight *rôle* in practical medicine. This has been chiefly on account of its not being generated easily and because it cannot be kept long. I have, through the kindness of the Ozone Manufacturing Company, of New York, been able to satisfy my mind upon the fact of the practicableness of ozone, both as ozonized oxygen and in various preparations, and of the marked essential differences that will be found between this body (ozone) and hydrogen peroxide in therapeutics. Each will have its special field of action, and it is only right not to confound one with the other; and to speak of hydrogen peroxide depending upon ozone as the active factor is as erroneous as to say, "Ozone depends upon water in combination to act as an oxidizing agent"; or to say: "If ozone is combined with water it is hydrogen peroxide."

25 WEST FORTY-FIFTH STREET.

[1] On the Density of Ozone.

[2] Philosophical Magazine, 31-34.

[3] Other experiments have shown that the essential oils of cassia, cinnamon bark, and spruce absorb ozone readily.

[4] The number of molecules contained in the same volume of every kind of gas is the same.

NEW PROBLEMS OF NUTRITION IN HEALTH AND DISEASE.[1]

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THE use of iron in anæmic conditions is nearly as old as the history of medicine, and it has always been regarded as one of the most precious remedies that we have. Even in popular opinion it has its place, although it has won this position since chemical analysis first showed its presence in the blood-

[1] Delivered as one of the lectures of the Post-graduate Medical Course of the University of Toronto, December 20, 1890.

pigment. How the remedy effected the removal of the anæmic condition was not explained until after the same demonstration.

The first theory worthy of attention was put forward by Fourcroy, who believed the blood-pigment to be a solution of basic phosphate of iron in albumin and that he could form thus the destructive coloring-matter of the blood. Others at the same time described the gradual change to red of the coagulated chyle, when the latter was exposed to the air, and it was further stated by some observers that the chyle from the thoracic duct, especially from that of the horse, undergoes this pigmentation even before its removal from the duct. These observations, although not found correct by skilful observers, among them Johannes Müller, served for a long time as a support to the theory of Fourcroy.

Our more modern theories have not advanced much beyond this one. At the present day the view most prevalent amongst the exponents of medical science is that the iron salts of the food unite with the albumins to form albuminates which, in some way, pass into the system to give origin to hæmoglobin. It was never explained in what way the unstable and weakly-combined iron albuminates became converted into a compound in which the iron is so firmly combined that the chemical tests for the metal fail to show its presence. Still the facts that iron in some form is detectable in the foods and that it is present in hæmoglobin were strong enough to silence almost wholly all criticism of the theory. The advocates of the theory pointed to clinical experience. The administration of iron in ordinary anæmias and in chlorosis has been followed in countless cases by marked and permanent improvement. The cause of these abnormal conditions has been always considered a defective supply of hæmoglobin, and the long-continued dosing with iron resulted in an increase of the hæmoglobin in the blood. These being the facts, no other interpretation than the prevailing one could be heard.

Recently, however, Bunge[1] came forward with another theory, built upon the results of his experiments on the nature of the iron-holding compounds in the yolk of the hen's egg. As this theory is, in my opinion, destined, in a modified form, to supplant the one just described, it is worthy of an extended description here. It is well known that the hæmoglobin of the blood of the chick is formed out of compounds present in the yolk. What these compounds are no one knew until Bunge analyzed them. On the basis of the older view the yolk was assumed to contain an inorganic iron salt. Bunge, by methods which I need not describe, isolated an iron-holding compound of the nature of a proteid, but containing phosphorus and therefore belonging to the group called nucleins. Like the latter it does not dissolve in gastric juice; in other words, it cannot be converted into peptone, and it dissolves in alkaline solutions, from which it may be precipitated by acids. Its iron is not removable by the hydrochloric acid of the gastric juice, and is only so separated when the acid solution is considerably more concentrated. The ordinary alkaline sulphides, such as ammonium sulphide, attack the compound and separate the iron as sulphide when both are kept at or near body temperature for several hours. This iron-holding nuclein Bunge called hæmatogen because he considered it to be the substance out of which the chick's hæmoglobin is produced, and as he determined the existence of similar iron-holding nucleins in milk, and in that part of our food furnished by the cereal and leguminous plants, he concluded that the hæmoglobin of the blood of all animals is directly or indirectly derived from the iron-holding nucleins of the vegetable kingdom. In the animal body these compounds are assimilated in some way and the assimilated product appears as hæmoglobin.

The benefits obtained from the exhibition of iron in simple anæmia and chlorosis are explained by Bunge in the following manner:

In ordinary anæmia, for example, there are in the intestine more or less putrefaction and fermentation due to lack of digestive vigor on the part of the stomach, which permit, therefore, a freer entrance of bacteria than in health. In this putrefaction alkaline sulphides are formed; these act on the iron-holding nucleins and separate their iron, which is excreted with the fæces as sulphide. If, however, sulphides are abundant, all the hæmatogens are decomposed, their iron is removed, and the system consequently deprived of the usual supply of that compound necessary for the formation of hæmoglobin. Should this condition continue long enough the results are a marked diminution in the quantity of hæmoglobin and an asthenic condition due to the deficient respiration of the tissues. Could these sulphides be decomposed and rendered inert in some way, the hæmatogens might be saved for assimilation and the anæmic condition thereby removed. Iron and iron-salts readily effect this decomposition by combining with the sulphur of the sulphides, and if administered in large quantities the whole of the alkaline sulphides is thereby disposed of. The hæmatogens, which are thus protected from decomposition, can consequently be absorbed as such, and as the digestive and secreting vigor of the stomach gradually returns with the increase in the amount of hæmoglobin in the blood, intestinal putrefaction is diminished and the alka-

[1] Zeit. für Physiol. Chemie, Bd. x. p. 49.

line sulphides cease to be formed in considerable quantities. In Bunge's view, therefore, the administration of iron to anæmic and chlorotic patients is for the purpose of protecting the iron-holding nucleins from decomposition.

Sometimes the administration of hydrochloric acid, without any iron at all, removes the anæmic condition, and Bunge believes that this happens especially in those cases in which the gastric juice is deficient in quantity and therefore feebly germicidal.

In support of Bunge's theory it may be considered as established that the whole or nearly the whole of the iron salts administered with the food passes out with the fæces as sulphide. Furthermore the most careful experiments of Hamberger[1] show that iron-salts given in the food are not assimilated into the system, and consequently it is improbable that there can occur in animal tissues a synthesis of hæmoglobin from iron salts and a proteid or proteids of the food.

It may be urged that the synthesis of an iron salt and a proteid may take place in the body, and yet the facts in support of this may be so difficult of access, that experiments in the chemical or physiological laboratory may not show them. Again, since the amount of iron in the blood of an adult individual averages 3 grammes, and since in health the amount of iron in the urine—assuming this to be the only mode of excretion[2]—is from 3 to 5 milligrammes daily, it is obvious that if inorganic salts are absorbed by the intestine to make up for this loss not more than 1.5 grammes of the metal are so utilized in a year. Now this quantity is so small as to be beyond estimation, when one has to take into account that in a year an enormous quantity of food is ingested and a large quantity of matter excreted as fæces and urine. In fact the errors of experiment would be vastly greater than 1.5 grammes. This objection is, I think, well taken, and unless it can be shown that such absorption of inorganic iron compounds is unnecessary or contrary to our knowledge of animal metabolism, it will be fatal to Bunge's theory.

We must, therefore, turn to the teachings of biology on this point. It is a well-known fact that plants cannot grow without access to iron salts in the soil. If a plant is reared in a solution containing all the other chemical ingredients necessary for its nutrition, but absolutely free from iron compounds, it is completely colorless; in other words, it fails to develop the green coloring-matter which is generally credited with the power to build up, under the influence of sunlight, starch from the carbon dioxide of the air. It was at first suspected from this that the iron entered into composition with the chlorophyll, or was associated with the latter in some way. Such a connection, however, has never been observed, and all solutions of chloropyll are free from iron. What is done with iron in the vegetable cell was not known until the results of Bunge's researches were published. We now see that it is united with the nuclein so firmly that the ordinary tests for it fail to reveal its presence. There can, therefore, be no doubt of the absorption and assimilation of iron by the vegetable organism. Indeed, one can see this clearly when one strokes a bleached plant grown in an iron-free solution, with a glass rod moistened with a weak solution of an inorganic iron compound. Some hours after doing so there is along the line of the streak a green color, showing that, in that time, the cells have so vigorously absorbed iron as to enter on their full functions.[1] Now the absorption of iron is so prominent in plants that we may say it is a special vegetable function. We are, moreover, in the habit of drawing broad lines of distinction between vegetable and animal metabolism. We say that the vegetable-cell builds up chemical compounds out of simple chemical substances, and stores up energy from the sunlight, and in contrast that the animal cell decomposes the same compounds and derives therefrom its energy. In the animal-cell any formation of complex compounds out of simple chemical compounds is impossible. It is true there are views current that fats are partly derived in some way from the starchy part of food, but these views cannot be held to vitiate the conclusion already given until it is finally and definitely shown that the absorbed carbohydrates of the food do more than protect from decomposition the fats derived as such from the foods, or the fats obtained by metabolism from the proteids of the food or of the body. Now, if construction of complicated chemical compounds out of simple ones is a function of the vegetable-cell, while the animal-cell decomposes the same compounds, but does not build up, why should we make an exception as to the formation of iron-holding proteids in the case of the animal-cell? We know that in hæmoglobin the iron is very firmly combined, and it is even as firmly combined in the

[1] Zeit. für Physiol. Chemie, Bd. ii. p. 191.

[2] There are other channels for the excretion of iron. It is admitted that the bile contains iron compounds and it is furthermore shown in experiments in which animals are given iron-salts subcutaneously that the intestinal mucosa functions as an iron-excreting organ.

[1] Recent experiments and observations have rendered it extremely probable that it is the nuclear material in vegetable-cells which is the principal agent in the formation of carbohydrates out of simple substances, and that the carbohydrates so formed are passed from the nuclein to the chlorophyll grains, where they appear as starch. The inference from this is that the iron absorbed is fixed in the nuclear substance. See, on this point, Strasburger, Ueber Kern und Zellthilung, January, 1888, p. 194.

iron-holding proteids from the seeds of various plants. Why not say at once, as Bunge has done, that the hæmoglobin is derived from iron-holding proteids of the vegetable kingdom, sometimes directly, sometimes remotely?

There are a number of facts which tend to show that the broad distinction between the metabolism of the animal and that of the vegetable-cell holds good with regard to the iron-holding proteids. One fact is that obtained by a study of the transferrence of iron from the maternal organism to the egg in fish, amphibia, reptilia, and aves, or from the mother to the fœtus in mammalia. Bunge's hæmatogen is a compound carefully and elaborately prepared long before fertilization takes place, and as such it is deposited in the yolk-spherules of the egg. In other words, the embryo receives its supply of iron in the form of an iron-proteid compound, and it passes a certain part of its existence fully supplied from this source with all the iron it requires. Bunge has, furthermore, shown that the newborn mammal starts into the world with a larger quantity of iron in its body per kilogramme of weight than the older animal has. According to this observer, the iron of milk, the food of the suckling, is firmly combined with a nuclein. I may mention, too, that experiments and observations, such as those of my own, to be described further on, indicate, in the cat at least, that the maternal tissues transfer to the fœtus or embryo not an inorganic iron compound, but an iron-holding proteid. It is thus seen that the developing animal-cell or organism is carefully provided by the maternal organism with a supply of a firm, stable, iron-holding proteid, and that it receives iron in no other form. On the other hand, the vegetable ovum receives just so much iron as will enable it to develop chlorophyll enough for its seed leaves, after which its embryonic root furnishes by absorption all that is needed for its future growth. There is, therefore, a great difference between animal and vegetable organisms on this point. The vegetable-cell has manifestly and preëminently the capacity to combine iron with proteids, and it is equally manifest that the animal-cell, if it has this capacity, leaves it in abeyance in the embryo and in the suckling animal. The question now is, whether the cells of the adult animal have this capacity, and if so whether they use it. The treatment of anæmia and chlorosis seems, as already pointed out, to give an affirmative answer to these questions. The answer, however, is not quite satisfactory, for it must be noted that it is only in large doses that iron is effective in removing the anæmic condition, while only from 3 to 5 milligrammes are absorbed and assimilated in health, assuming that the 3 to 5 milligrammes daily excreted in the urine represent the total amount of the iron derived from the disintegrated hæmoglobin of the body. Is it to be supposed that even a very much greater quantity of iron, in the form of inorganic salts, is wanting in the food of anæmic patients? If the system is capable of building up iron-holding proteids, why is not this large quantity of inorganic iron compounds absorbed and assimilated in anæmic patients as it is, supposedly, in healthy individuals? Is the fault to be found in a lessened capacity of the system to absorb iron salts? If so, what explanation of this lessened capacity can be given? The current view as to the cause of anæmia is that there is too little of any iron salt in the food for absorption, an explanation not firmly founded. If there is too little iron in the food how comes it that in some patients chlorosis may disappear without the administration of iron salts at all, or that in others it may be removed by the administration of hydrochloric acid alone?

We are, therefore, driven back to Bunge's theory for the explanation of the mode of the absorption of iron in health, and of the action of iron salts administered to anæmic patients. Now it must be acknowledged that as far as it goes the theory is the most satisfactory one yet offered to explain the facts. I use the phrase, "as far as it goes," advisedly, because my own researches and observations show that the theory must be considerably extended to cover all the phenomena which they present. These researches were begun five years ago, and they have been carried on with varying intermissions up to the present time. So definite have the results obtained from them lately appeared to us that I thought a connected description worthy of publication, and I have chosen this occasion for explaining them, for discussing the bearings which they have on our knowledge of nutrition, and for putting forward explanations of my own as to the nature of certain diseases.

All of these researches bear on the chemistry of the animal-cell, and, as cytologists have always known more about the structure of the latter than have physicians, it may be interesting here to connect the plain facts of structure with those of composition. The animal-cell usually contains two different morphological elements, the cell-body and the nucleus. The cell-body contains what is usually termed protoplasm, but this is by no means a simple compound, for from it can be obtained albumin, globulin, albumoses, fatty compounds, and glycerin, while its membrane, as well as that of the nuclein, is formed out of a compound called plastin. Now, disregarding the non-proteid elements, we may say that the cell-body is generally made up of proteids, which are like one another in percentage composition, and which are mainly distinguishable from one another by precipitation-tests. In the nuclein, on the other

hand, there are present like proteid compounds, with a peculiar substance which is called *chromatin* by cytologists and *nuclein* by physiological chemists. The term chromatin has been given to it owing to its special affinity for staining reagents. It is sometimes more or less diffused through the nucleus, but usually it is in the form of small granules or clumps called indiscriminatingly nucleoli. When, however, the quantity of chromatin in a nuclein is increased beyond a certain point the nucleus and the cell pass through a series of structural changes grouped under the name karyokinesis, or cell-division, in which the chromatin plays a very important part. The nuclei of the two newly-formed cells have each exactly half of the chromatin of the original nucleus, and when the so-formed nuclei have increased their amounts of chromatin again up to a certain point the same series of phenomena occurs, resulting in the formation of new nuclei and cells. We may turn to other facts to illustrate the importance of chromatin for the life of cells. For instance, it is well known that the greater part of the substance of the head of spermatozoids is composed of chromatin, and it is chromatin only which is transferred to the ovum as the fertilizing agent. It is, in other words, the carrier of those qualities of the male parent which appear in the offspring. The vigorous embryonic cell, according to Minot, is rich in nuclear material—chromatin—while it is poor in cell material. The cells in the old individual present the opposite condition—the cell-material is large, the nucleus correspondingly small. We may say, then, that, other things being equal, the most vigorous cell is the one whose nucleus contains the largest amount of chromatin.

I have already said that the physiological chemist terms this substance nuclein. The latter name was given to it before it was generally thought by cytologists that there could be a specific element in the nucleus. It was isolated from the nuclei of pus-corpuscles, from semen, from the testicles, ovary, etc., and it was found to possess in addition to carbon, hydrogen, oxygen, nitrogen, and sulphur[1]—elements present in ordinary proteids—the substance phosphorus. Now, although nuclein is derivable from chromatin, I do not think the two are identical. In fact, I shall give reasons further on for regarding the nuclein molecule as merely the skeleton of the chromatin molecule. This is readily intelligible when one considers the thorough methods and the strong reagents by which the nuclein is usually prepared. It must also be remembered that if the chromatin is, as Pfitzner calls it, the ground-substance or physical basis of life, chemical changes are ever occurring in it, so that the chromatin compounds in two adjacent cells in the body may have quite different atom-groups tacked on to the molecule-chain. The nuclein, isolable from these two cells, however, would be either a mixture, or a compound very unlike the two chromatin substances which make all the differences in the life of the individual cells.

That this chromatin substance is different from the nuclein of Miescher and others I will now proceed to show.

In the summer of 1885 I observed certain staining-reactions in the nuclei of the red blood-cells of *Necturus lateralis* which were quite different from anything that I had ever seen before. At the time, I believed the peculiar staining-reactions to be due to a substance in some way or other connected with the production of hæmoglobin. A full opportunity to study the phenomena did not present itself till the following spring, when I obtained a number of *Amblystoma* larvæ, which I used in the investigation of this problem. I found that in the hæmatoblast the chromatin was excessively abundant, and just as the chromatin diminished in quantity in the developing red cells so the hæmoglobin increased.[1] I found, moreover, that the hæmoglobin is derived in the same cell from a substance which is diffused out of the nuclear chromatin, and even out of the chromatin loops of the dividing hæmatoblast. The conclusion then adopted was that the hæmoglobin is formed from the chromatin. Support for this conclusion was at that time found in the fact that Bunge had recently isolated an iron-holding nuclein, and in the fact that if the hæmoglobin is derived from the chromatin we may explain more readily the absence of a nucleus in the red blood-cells of mammalia, on the ground that the greater part of its chromatin is transformed into hæmoglobin, and that therefore, the necessity for a chromatin-holding organ is done away with.

During the next year I continued my studies on the origin of hæmoglobin in larval *Amblystomata* and in the spleen of adult *Necturi*, and in the following spring I definitely formulated the view[2] that hæmoglobin is derived from chromatin. *In other words, the chromatin of the hæmatoblasts must contain iron.*

I had in mind the fact that Bunge's hæmatogen is a nuclein. The question now arose, Are there nucleins which are not derivable from the nuclear chromatin, and what is their origin? The hæmatogen of Bunge is deposited in the yolk of the egg, not in its germinal vesicle, and if the latter has not, at any stage of its history, anything to do with the formation of hæmatogen it might be said that in the

[1] Some of the nucleins have been shown not to contain sulphur.

[1] This was previously noticed by Flemming and others.

[2] Presented as thesis for the degree of Ph.D. in the Johns Hopkins University.

developing hæmatoblasts of *Amblystoma* larvæ the hæmatogen of Bunge passes from the yolk-spherules to the nuclear chromatin, to be there converted into hæmoglobin, without the transformation of any of the chromatin itself into the pigment. In that case the presence of iron or iron-holding compounds in the chromatin would be merely a special case, and not of general significance. I studied the genesis of the yolk in the ovarian ova of *Necturus* and came to the conclusion that the nuclein present in the cell of the ovum is derived by diffusion from the abundant chromatin of the nucleus of the same ovum. That the nucleus of the developing ovum gives something to the yolk was already apparent from the observations of Scharff, Will, and Sheldon, but these investigators did not determine definitely what is so given. As Bunge found only one nuclein in the yolk it is very probable that his hæmatogen is the same as the chromatin diffused from the nucleus of the ovum.

Again, Bunge found the nucleins of milk to contain iron, and, therefore, to belong to the hæmatogen group. We know, from the researches of Nissen and others, that the cells of the secreting tubules of the mammary gland, after they have passed a series of changes resulting in the formation of fat-globules and the ordinary proteids of milk, break down, their nuclei undergo degeneration, and the chromatin is cast out into the contents of the lumen of the tubule to constitute apparently the milk-hæmatogen of Bunge.

In 1886 Zaleski isolated from the nuclei of the liver-cells of various animals a substance somewhat like Bunge's hæmatogen, but differing from the latter in that it holds the iron combined in itself much more firmly. This compound Zaleski evidently thought peculiar to the liver-cells, for he names it *hepatin*. It is probably the true chromatin of the hepatic nuclei. Owing, I suppose, to the fact that the liver is generally regarded as a blood-forming organ, and that, therefore, it is possible that one or more stages in the transformation of hæmatogens, or of iron-holding proteids into hæmoglobin, are passed in the liver, Zaleski apparently thought it quite natural that such iron-holding proteids should be found here.

(To be concluded.)

A CASE OF HYSTERICAL DEAFNESS.

BY H. V. WÜRDEMANN, M.D.,
OF MILWAUKEE.

THE literature of hysteria is very extensive, but though hysterical deafness has long been noticed, very few cases have been reported, and the subject has not been as thoroughly investigated as other phases of this omnivagant disease. The case here reported is somewhat unique from the fact that the general sensation was impaired upon both sides to about an equal degree, and because there existed at the same time an intercurrent disease, which, at first, was sufficient to produce the ear symptoms, and to obscure the diagnosis.

Miss F. S., of German birth, was sent to me by Dr. Wahl on April 29, 1890, on account of interstitial keratitis and deafness; the latter affection was of two weeks' duration, and arose from a severe cold. The eye-trouble has existed for years, and the patient has well-developed Hutchinson's teeth. She is well nourished and somewhat stupid. Speaks both English and German. She was treated for "chorea" about two years ago.

She had well-developed catarrhal otitis media in both ears, and the secretion could be seen through the drum-membrane of the right. Hearing distance, right ear, by the watch, 8 cm.; left, 75 cm. (normal 150 cm.). The left ear was cleared by catheterization, but the fluid could be removed from the right tympanum only by paracentesis of the membrane. After the fluid was removed, hearing distance, R. $= \frac{15}{CL}$; L. $= \frac{120}{CL}$. It was noted at the time that the patient did not seem to feel the needle, but no investigation was made in regard to it. The ordinary treatment was used for the eye, and the ears were inflated by the Politzer bag several times until May 7th, when she complained that she was unable to understand the speech of the members of her own family, and her father, who came with her, corroborated this statement. She seemed to hear and understand everything that I said both in English and in German. The hearing seemed to be again increased by the use of Politzer's bag, but the watch could not be heard.

The next day she asserted that she was totally deaf. She could hear the voice, but could not distinguish any words. The low-pitched tuning-fork could be heard through the ear but not through the bone, and the fork of high pitch could not be heard at all. This condition corresponds with the statements of others in reference to hysterical deafness,[1] and first led to the suspicion of the true condition. The objective symptoms of the catarrhal inflammation seemed very slight, and the Eustachian tubes were open to Politzerization. There were areas of anæsthesia and analgesia embracing parts of the pinna, the auditory canals, and the drumheads of both sides in the same degree. The prick of a pin in the canal and the touch of a probe upon the drums gave rise to no pain. On her knees, feet, and hands sensation was lessened as far as could be ascertained from the patient, whose perceptive faculties seemed to be even more dulled, and who was evidently frightened by her symptoms. The knee-jerk seemed normal. The application of a magnet was tried as a means of diagnosis, as is recommended by several writers,[2] but as suspected without result. The electric current was also used with like result.

[1] G. L. Walton: Hysteria, Ref. Handbook Med. Scien., vol. iii. p. 808.

[2] Politzer: Ohrenheilkunde, p. 520. Gruber: Ohrenheilkunde, p. 632.

The treatment adopted was mainly calculated to produce an impression on the patient. It consisted in the use of a sufficiently strong current of galvanic electricity to the ears and nape of the neck to produce a decided burning sensation. A blister was applied to the nape of the neck and the mastoid processes. The use of hot baths at night was recommended, and the previous alterative and specific treatment for the eye and ear was continued.

Three days later she could hear and understand words spoken in German, but not in English. The next day both languages were plainly understood, and the hearing-distance, by the watch, was R. = P (pressure of watch upon meatus); L. = $\frac{50}{CL}$. The patient was seen several times, and the previously-described treatment was used. She discontinued treatment some two weeks later, when conversation in both German and English was easily understood, and hearing-distance was R. = $\frac{30}{CL}$; L. = $\frac{150}{CL}$. The areas of diminished sensation persisted on either side, but in less degree. The membranæ tympani were restored to their normal appearance.

805 GRAND AVENUE.

CLINICAL MEMORANDUM.

OPHTHALMOLOGICAL.

A Case of Traumatic Paresis of Accommodation.—On the evening of July 6, 1890, Dr. W. was struck in the face by a boy from whom he was pulling a tooth. The blow glanced upward along the right side of the nose and reached the right eye with considerable force. For two hours the eye was painful; but after the pain ceased the circumstances of the injury were forgotten and not called to mind until four days later. On the day following the injury the upper lid was swollen, red, and sore. This condition slightly increased for four days, and extended into the cellular tissue around the eye. Pressure produced some pain, and the patient feared severe orbital cellulitis, but an unusual amount of work prevented him from receiving appropriate treatment. A few applications of liquor plumbi subacetatis, ½ drachm to 6 ounces of water, were made without much apparent benefit.

On the morning of July 11th Dr. W. noticed blurred vision of the right eye when looking at near objects. I examined the eye with an ophthalmoscope and by oblique illumination and found no evidence of iritis. The pupil was in no respect different from that of the other eye. One drop of eserine sulphate solution, 2 grains to an ounce of water, was instilled into the eye. The dimness of vision and symptoms of cellulitis diminished during the day. At night another drop of eserine solution, ⅔ grain to the ounce, was dropped into the eye. A weaker solution was used because the drop instilled in the morning produced strong, spasmodic contraction of the pupil.

The patient experienced no further trouble until the morning of July 13th, when he found that distinct vision for near objects was entirely gone in the injured eye, and great dilatation of the pupil—a mere rim of iris, $\frac{1}{16}$ or $\frac{1}{12}$ inch broad, remaining. For distance, V. = $\frac{6}{IX}$(Sn.), equal to that of the other eye. All symptoms of cellulitis had disappeared.

One drop of the weaker solution of eserine contracted the pupil and restored the power of accommodation. No further treatment was adopted, except the use of colored spectacles and rest. Slight paresis of accommodation returned after the effects of the eserine subsided; but this gradually wore off.

IDA R. GRIDLEY, M.D.

COLLINSVILLE, CONN.

ORIGINAL LECTURES.

A REPORT OF SIX CASES TREATED BY KOCH'S LYMPH FOR THE CURE OF TUBERCULOSIS.

A Clinical Lecture
delivered at the Philadelphia Hospital, January 28, 1891.

BY ERNEST LAPLACE, M.D.,
PROFESSOR OF PATHOLOGY AND CLINICAL SURGERY IN THE MEDICO-CHIRURGICAL COLLEGE; VISITING SURGEON TO THE PHILADELPHIA HOSPITAL, ETC.

[Reported by W. BLAIR STEWART, M.D.]

GENTLEMEN: I am under obligations to Professor Anders for the use of his hour this morning that I might present to you a few cases which have been treated in the hospital by Koch's lymph. In entering upon the subject, I take it for granted that you consider the question from the same point of view as I do, namely, that the tubercle bacillus is the cause of the development of tuberculosis; it develops at the expense of the tissues, liberating an irritant which causes a proliferation of the cells. These soon disintegrate, necrose, and change from a hyaline to a milky or cheesy mass. The cells have undergone fatty degeneration or coagulation-necrosis, as it is called, break down and, when in the lungs, form a cavity. This is the case where there are epithelial cells. The same occurs in fibrous tissue; the soil being different, the seed remaining the same. This was first proved by Koch in 1882, when he demonstrated the existence of the tubercle bacillus. He not only found, isolated, and stained the bacillus, but inoculated animals with it and always produced the same disease. I tell you this, so that you will understand that he did not stumble on the discovery; it was the outcome of eighteen years of hard and faithful study which finally culminated in extracting from the bacillus itself that substance by which he is able to destroy tuberculous tissues.

If any one of us were placed under such conditions that we had to reabsorb the urea produced, or breathe the carbonic acid gas from our lungs, we would soon die from its effects: so the germs die if they have to live in their own waste-products or, as we call them, *ptomaines*. Three years ago it was well known that Koch had been working constantly and had found something that would prevent tuberculosis in animals but with his modesty, he withheld the facts until he was forced to publish them by the Minister of Public Education of Germany. Until a few days ago, I could only surmise what the fluid he had discovered might be, but now we have had, as you know, a description of its preparation from Koch himself. Having isolated the tubercle bacilli, he cultivated them in artificial media—agar-agar or blood-serum and glycerin—collected them

and inoculated healthy guinea-pigs with the result that they contracted large ulcerated tuberculous patches, known as lupus, and ultimately died of the disease. Inoculating guinea-pigs that were suffering from tuberculosis with the same culture he found that there was no reaction.

The question then arose in his mind, if these are the results obtained with living cultures, what would be the result with dead cultures? He destroyed the same cultures with heat and antiseptics, injected some of this dead material into a healthy guinea-pig but did not get any reaction. He then injected it into a tuberculous guinea-pig with the result that the reaction was so strong that the animal died from dyspnœa in a few hours. All tuberculous guinea-pigs died within a few hours after an injection of a large dose of this dead culture. If this be the result with large doses, what would be the effects of smaller ones? Instead of giving one gramme he gave one one-thousandth of a gramme and found that the guinea-pigs lived and got better. He repeated the dose and the improvement was so great that the animals recovered. Here lies the foundation of the system we are now investigating. Therefore, we must give a small dose to know the effect; and, under these small doses, regional tuberculosis is checked.

We must divide our cases for study and treatment into two classes, viz.:

1. External or surgical tuberculosis, which comprises lupus—tuberculosis of the skin—and tuberculosis of the joints.

2. Internal or medical tuberculosis, including tuberculosis of the lungs and of other internal organs.

CASE. I.—Here is a woman who has had lupus involving her entire face, and her neck and back for more than forty years. It is now two weeks since we gave her the first injection. The remedy caused a chemical reaction that produced decomposition on the surface of the ulcers. In this case we were warranted in giving a larger dose than if the disease were internal, and within the two weeks of treatment the ulcers have healed. We proceeded about in the following manner: We gave five milligrammes and found that it caused a slight reaction. On the second day, we gave a larger dose and got more reaction. After this we gradually increased the doses until she received ten times the first dose, when the temperature rose to 102.5° F., and fell on next day to 99°.

Two days ago we gave her twenty-five times the original dose and scarcely any fever resulted, showing that, in spite of the increasing doses, the system was saturated with the material. I will now inject her with one hundred times the first dose to determine if she has received enough.

In order to preserve the lymph from decomposition when diluted, it is necessary to add one-half per cent. of carbolic acid.

CASE II.—Here is an interesting temperature-chart of this patient, who has been suffering from tuberculosis of the apex of both lungs, and also from hip-joint disease. He had a tubercular abscess with a number of sinuses for years. On one occasion it closed but soon reopened. Under injections of the lymph these sinuses and abscesses have closed, and he has shown signs of great improvement. Being a case of lung tuberculosis, as well as surgical, we were not warranted in giving him a large dose, which would excite inflammation about the tuberculous deposits and, if sufficient were given, would cause a violent pneumonia from which the patient would die—not from the lymph but from the pneumonia. We began treatment in this case with one milligramme and gradually increased the dose to three centigrammes, when his temperature rose to 104⅘° F. Finally we thought it best to let him rest for three days and then injected four centigrammes which caused an elevation of temperature to 104° F. An interesting fact in this case is that he was not very tuberculous and did not begin to react until he received two centigrammes. As soon as reaction to any degree takes place the temperature sinks below normal. As the patient has not reacted very much we know that his system is not saturated, and it will not be saturated until he ceases to react as the first case has done.

CASE III.—This boy has tuberculosis of the leg, knee, and ankle-joint. We began treatment by injecting one milligramme, then increased to five milligrammes, and later to one centigramme, when he reacted with a temperature of 104° F. Three centigrammes caused a temperature of 105° F.; six centigrammes 104.6° F. and this morning his temperature was normal. As far as the improvement in this case goes, the only thing we notice is that the dull, glazed, dirty surface of the ulcer has cleaned off and is assuming a healthy appearance. As far as the limb is concerned, the time is still too short to notice any great improvement, as in the case of lupus. The sinuses have swollen and a certain amount of serum and a piece of necrosed bone came from them, showing that a violent reaction took place. Should the tuberculous process in the bone be near the surface it would have separated more readily. The reaction in bone is the same as in other tissues, but the ability to heal is different in deep-seated lesions. At the last injection he received six centigrammes, and to-day we will give him ten centigrammes of the pure lymph.

CASE IV.—Here is an interesting case of a negress who had swollen glands in her neck and a peculiar eruption on her body that could not be positively diagnosed. In her case we tested the value of the lymph as a method of diagnosis. The day before it was used, her temperature was 104° F., while at the time of the injection it was 101° F. The lymph was used on alternate days and produced the characteristic rise of temperature that we would expect in a case of tuberculosis when treated by this method. After the injections the glands began to swell and became tender and sore, but assumed a normal appearance when the reaction passed off.

CASE V.—This man is the only case of tuberculosis of the lungs that we have treated with lymph in this hospital. For three years he has had a cough and we have demonstrated consolidation of the apex and the presence of bacilli in his sputum. After a dose of one milligramme he reacted, his temperature rising to 101⅜° F., and falling on the next day to 98° F. The second dose was two milligrammes, his temperature rising to 102° F.; a dose of five milligrammes caused a rise to 102.5° F.; twenty milligrammes to 102.5° F.; forty milligrammes to 103° E.; sixty milligrammes to 103.8° F., followed by a fall to 98.5° F. After the last dose the temperature rose to 100° F., showing that under increasing

doses the temperature does not rise so high and that the system is saturated with the lymph and the tuberculous tissue destroyed, He has not lost flesh, has a good appetite, and says that he feels better than at any time since he was first taken sick.

CASE VI.—Here is a young man who comes to receive for the first time treatment for tuberculosis of the lungs. There is consolidation at the apex of each lung, and numerous bacilli in the sputum. Professor Koch wishes that no cases of tuberculosis of the lungs be treated at first with larger doses of the lymph than one milligramme, as this amount will serve as a guide as to the strength of future doses. If the patient does not react by the second day we will give him five times the original dose. If he should react strongly we will give twice or three times the dose.

From what I have said, it is evident that the lymph acts as an irritant. If used pure, under the skin, it would cause sloughing, but when diluted it is taken into the circulation and does not cause the local effects. The strongest argument against the identity of scrofula and tuberculosis is the fact that the tubercle bacilli are around the cheesy, degenerated mass and not in it. The reason the bacilli are not found in the middle of the mass (the understanding of this fact gives us the keynote of the Koch treatment) is explained thus: When the gland began to be diseased it contained epithelial cells; these cells were irritated by the bacilli, proliferated, and caused the gland to enlarge and degenerate or become white and cheesy. Just as these cells were destroyed, so the bacilli were killed by their own refuse matter. The bacilli can exist only where the proliferation is still going on; this is the reason we cannot find them in the cheesy masses. Koch found that by injecting the lymph into the tissues it was taken up by the blood, and caused the same condition in the tissues throughout the body, which would destroy the bacilli and induce necrosis of the diseased tissues.

Great care is to be taken in administering the lymph, for inflammatory reaction is certain to follow the injection. Should too much lung-tissue, or other tissue essential to life, be affected, the reaction would necessarily hasten a fatal result.

The French claim that the treatment gives rise to albuminuria and hæmaturia, but the cases cited by them may have been unsuspected tuberculosis of the kidney or bladder. Two weeks ago none of us suspected that the first case I showed you had lupus on her forehead, but after the use of the lymph a red spot appeared on the forehead and a distinct reaction took place there, showing that the germs were present. In one case in Europe a boy was inoculated, after which there appeared a patch of redness on his nose, indicating a process that would have ultimately caused lupus; this was not suspected before inoculation.

The contra-indications for the use of the lymph are—

1. *Extensive tuberculosis of the larynx*, unless you have taken the precaution to perform tracheotomy previously or are holding yourself in readiness to do it at a moment's notice.

2. *Acute miliary tuberculosis.* A few months ago I treated a man for fistula in ano. He came to me a short time ago to be treated with the lymph. I found his temperature 104° F., and crepitant and subcrepitant râles in his lungs, and diagnosed acute miliary tuberculosis. I think he would have died under the first injection, had it been given to him. At present he is running the characteristic course of the disease.

3. *Tubercular meningitis*—from the necessary reaction in the brain that would follow the injections.

You may ask if I have seen cures. Out of the two thousand cases that I saw in Berlin, I cannot say that I have seen one case positively cured, but I have seen great improvement. I cannot speak of the improvement as a cure, but can now only confine myself to clinical facts, inasmuch as a year at least would be required to pronounce a case as permanently cured.

There may be a possibility of aggravating and disseminating the disease by the lymph, but there is nothing to prove that these results occur. In five cases that died under the use of the lymph, the autopsy showed that in each case death was due to pneumonia produced by the irritation from the reaction, and no new foci of infection could be detected. I have seen a case like the woman with lupus that was discharged as cured; three weeks later some tubercles reappeared, but under treatment again promptly disappeared. I think we can draw the following conclusions:

1. Koch's lymph is a valuable means of diagnosis, as a non-tuberculous person will not react under its use.

2. It is destructive to tuberculous tissue, and acts more effectively on tuberculosis of the surface of the body than elsewhere from the possibility of the diseased tissue being shed.

3. The results obtained so far warrant us in using it to establish further its real merits.

4. We cannot restore destroyed lung-tissue, but if we can prevent tuberculosis in the beginning—that is, change the tuberculous soil of the patient, we could soon have the disease under as complete control as smallpox is to-day. In fact, when the irremediably-affected persons would die we could almost eradicate the disease.

MEDICAL PROGRESS.

Gargle for Tonsillitis.—The *Gazette Hebdomadaire des Sciences Médicale* gives the following gargle as a useful one in tonsillitis:

℞.—Metallic iodine . . . . . 1½ grains.
Iodide of potassium } of each 15 to 45 "
Tannin }
Water . . . . . 2 ounces.
To be used as a gargle three times a day.

Lotion for Favus.—KAPOSI recommends the following lotion in the treatment of favus:

℞.—Carbolic acid . . . . . 75 grains.
Glycerin } of each . . . . . 1 ounce.
Alcohol }

After allowing this solution to remain on the part for twenty-four hours, and upon the removal of all hair, the head is to be washed twice a day with green soap. Aftes each washing the lotion should be reapplied.

Application for Cancer of the Uterus.—According to *L'Union Médical*, BRAUN recommends the following

mixture to be applied to carcinomatous ulcers of the uterine cervix.

℞.—Bromine . . . . 30 grains.
Alcohol . . . . 2½ drachms.

The surrounding parts should be protected by tampons. After the application the surface is to be covered with absorbent cotton, sprinkled with benzoate of sodium. At the same time narcotics are to be given internally to relieve the pain and insomnia. For the relief of vomiting pieces of ice or gaseous waters or small quantities of cherry-laurel water may be administered. Disinfecting vaginal injections composed of chlorinated lime, thirty grains to two drachms to a pint of water, should be given.

Prescription for Hæmoptysis.—DE MOUSSY recommends the administration of the following pills for hæmoptysis:

℞.—Powdered ergot, Powdered extract of rhatany } . 1 drachm.
Extract of belladonna . . 5 grains.
Powdered digitalis . . . 10 "

Make into forty pills and give from four to six at a time. Insist upon the patient's remaining in bed, apply heat to the extremities and allow the patient to swallow small pieces of ice.

Calmative Mixture for Hysteria.—According to *L' Union Médical*, GRASSET employs the following prescription in hysteria:

℞.—Chloral, Bromide of sodium } of each 1 drachm.
Extract of belladonna . . ½ grain.
Extract of cannabis Indica . ½ "
Syrup of acacia . . . 2 ounces.

Of this mixture from one to four teaspoonfuls may be given. If one teaspoonful is given it may be repeated every half-hour or hour until eight doses have been taken.

The dose may be placed in a tumblerful of infusion of orange-flowers. If pain is associated with hysterical insomnia antipyrine may be given, and it is well to administer arsenic, if the mixture, just mentioned, containing bromide, is used for any length of time.

Powder for the Treatment of Hay-fever.—*L' Union Médical*, January 10, 1891, gives the following prescription for the treatment of hay-fever.

℞.—Powdered boric acid . . . 30 grains.
Powdered salicylate of sodium . 35 "
Hydrochlorate of cocaine, finely powdered . . . . 1 grain.

This powder is to be snuffed up into the nasal chambers and if there be any ocular manifestations of the disease, collyria composed of weak solutions of sulphate of copper or of sulphate of zinc may be employed. It is also recommended that the patient shall inhale ten drops of the iodide of ethyl from a handkerchief; or six drops of the nitrite of amyl will be found useful if employed at the beginning of the disease.

Ergotine in Gonorrhœa.—According to *La Médecine Moderne*, ROICKI, a Russian, uses the following solution of ergotine with extraordinary success in the rapid cure of gleet. The ergotine is administered in pill-form by the mouth and by urethral injections simultaneously. Injections are made up as follows:

℞.—Ergotine . . . . . 5 grains.
Distilled water . . . . 1 ounce.—M.

Use as an injection several times daily. It is stated that these injections are well borne and that the same treatment is applicable to hæmorrhages from either the ureters or urethra.

Incompatibility of Calomel and Antipyrine.—A writer in the *Western Druggist* points out the fact of the imcompatibility of these bodies, a gray color developing in them when mixed and after moistening. The change is due to a reduction of the calomel and a simultaneous change in the antipyrine. The nature of the change has not been elucidated, but that the combination is a dangerous one, the writer indicates by calling to mind the fact that the death of a child has been reported in New York City, the fatal result taking place within a short time after the administration of a dose containing these two substances. The lists of incompatibles of antipyrine that have hitherto been presented have not included calomel.

Antipyretics.—A study of the action of the antipyretics has led DRS. PODANOWSKY and POPOFF to the following conclusions:

1. The antiphlogistic action of the quinine salts, resorcin and thallin, is due to their specific influence on the heat-centres in the anterior part of the cerebrum, for after the division of the spinal cord even very large quantities of those drugs do not change the cerebral temperature.

2. The nature of this action must be inhibitory, probably following a primary excitation.

3. The absence of influence by the majority of antipyretics upon the surface-temperature of animals whose cords have been cut, and hence with unchanged excitability of the vasomotor centres, corroborates the hypothesis of a special vasomotor centre in the anterior part of the brain, which probably serves for increased heat-dissipation in cases of excessive heat-production.—*Wiener med. Presse*, December 28, 1890.

Subcutaneous Injections of Creasote in Pulmonary Phthisis.—The following formula for the subcutaneous injection of creasote is proposed by CASSIN and TOUSSAINT:

℞.—Creasote . . . . . 1 drachm.
Oil of sweet almonds . . ½ "

According to Cassin, the injection should be made into the tissues immediately below the scapula and deep enough to get into the loose cellular tissue.

Gimbert employs creasote two and a half drachms and olive oil five ounces, thoroughly sterilized. For the thorough sterilization of the oil it is sufficient to raise the temperature to 120° C. The injection should be made very slowly and the fingers should be placed over the orifice made by the needle when it is withdrawn, in order to prevent any of the liquid from escaping.

In from five to ten minutes the breath of the patient has the characteristic odor of creasote, and this odor persists for several hours. The injections may be practised every two days. The result of their use is a diminution in the expectoration, a return of the appetite, and a disappearance of night-sweats. Gimbert asserts that he obtains definite cures by this method of treatment.

The contra-indications to the employment of creasote are fever and hæmoptysis. It is thought that the value of its use depends upon pulmonary hyperæmia. Those patients who have the chronic form of phthisis and little fever, present the best opportunities for successful treatment.

The Proper Method of Using the Uterine Dilator.—PROFESSOR H. A. KELLY (*American Journal of Obstetrics*, January, 1891) reports the case of a young woman whose cervical canal had been dilated with Wilson's and Ellinger's instruments. When Dr. Kelly first saw the case, four days after the operation, she had symptoms of septic peritonitis and a fœtid discharge from the vagina. On examination a rotten, coarse sponge, the remains of a tent, was found projecting from the external os. On removing this, a rent about three-fourths of an inch long, half an inch above the os, and opening into the peritoneal cavity, was discovered. Abdominal section was advised, but was refused until five days later, when it was done with the patient almost moribund, death following in a few hours. It was evident that during the dilatation a small hole had been made by the small dilator and torn widely open by the large instrument, the sponge-tent being inserted into the rent and insuring infection of the peritoneum.

In commenting on this case, Dr. Kelly writes that the liability of perforating an anteflexed uterus by sharp and strongly-curved instruments is so obvious that the accident has probably occurred more than once. In inserting a dilator force should never be employed, but the instrument should be delicately poised between the thumb and first finger and gently "persuaded" to enter the canal, the direction of which should have been previously determined. Further, the method of dilating the canal by screwing together the handles of the instrument, with no relaxation, almost invariably causes a long laceration, sometimes through the entire thickness of the cervix. Instruments with ratchet and screw devices are, therefore, to be condemned, and one with a simple spring between the blades to be used. In operating with such an instrument Dr. Kelly carefully inserts the blades, gently dilates the canal for a moment in one direction, then relaxes the pressure, rotates the instrument slightly and again gently dilates, repeating the procedure until the canal has been twice gently dilated in every direction.

Treatment of Fissured Nipples.—According to the *Gazette de Gynécologie*, the following lotion is useful for the treatment of cracked nipples:

℞.—Balsam of Peru } of each ½ drachm.
Tincture of arnica }
Oil of sweet almonds . . 1 ounce.
Lime-water . . . . ½ "

Mix, and apply to the fissured nipple after the infant has finished sucking.

Injections for Gonorrhœa.—In the *Journal de Médecine de Paris*, SILBERMINZ is said to use the following mixture for urethral injections in gonorrhœa:

℞.—Salicylate of mercury . . 3 grains.
Distilled water . . . . 4 drachms.
Gum arabic, a sufficient quantity to make an emulsion.

Shake well before using, and inject a small syringeful into the urethra three times a day.

The Use of Iodol.—According to EGASSE, iodol presents great advantages over iodoform as an antiseptic. The author employs it in a solution made in the following manner:

℞.—Iodol . . . . . 1 part.
Alcohol (95 per cent.) . . 16 parts.
Glycerin . . . . . 34 "

For inhalations, Cervesato employs the following:

℞.—Iodol . . . . . 1 part.
Absolute alcohol . . 4 to 5 parts.
Glycerin . . . . . 10 "
Water . . . . . 10 "

The iodol is dissolved in warm alcohol, and then added to a hot solution of concentrated glycerin, when a yellowish-brown color occurs in the solution.

Pick is said to employ iodol by dissolving one part in five of ether; or, where small abrasions are to be covered, he employs iodol collodion made in the following manner:

℞.—Iodol . . . . . 1 part.
Ether . . . . . 10 parts.
Gun cotton . . . . . 5 "

An ointment may also be made by adding 15 grains of iodol to 2½ drachms of vaseline, or from 5 to 10 parts of iodol to 100 of lanolin. Iodol-gauze may be prepared in the same manner as iodoform-gauze.

Treatment of Otitis Media Purulenta.—PENTKOVSKI, a Russian, uses the following treatment for this condition. After distending the Eustachian tube with the Politzer air-bag, he washes out the ear with a warm solution of the sulphate of sodium, of the strength of five per cent., after which he uses the following mixture, heated to about the temperature of the body:

℞.—Essence of peppermint . . 3 grains.

Dissolve in absolute alcohol 75 minims, and add

Distilled water . . . . 1½ ounces.

Mix, and label "For external use."

After the external auditory canal has been cleansed by this application, he introduces a tampon of cotton prepared by immersing it in a solution of one-half to one per cent. of the essence of peppermint in sulphuric ether. After ten or fifteen days of this treatment the suppuration diminishes, and finally ceases. In other cases he employs a powder consisting of boric acid which contains one per cent. of the oil of peppermint.

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SATURDAY, FEBRUARY 14, 1891.

PERTUSSIS AND ITS TREATMENT.

AMONG the diseases that have been proverbially obstinate in resisting our efforts to abort or shorten their course stands whooping-cough. The character of the disease is so complex, a mixture of catarrhal and neurotic phenomena, that authorities are still at variance in regard to its nature, and as to whether the catarrhal or the spasmodic element is the essential disease-phenomenon. That it has many features in common with diseases which are almost certainly of microbic origin has led to investigations that, unfortunately, cannot as yet be considered conclusive in regard to the presence of a specific germ. The curious nervous phenomena may at some future date be found entirely dependent upon the bronchitic condition, in which case the disease will resolve itself into an epidemic bronchitis. This view has been strongly urged and has been adopted by many, yet numerous careful observers still cling to the idea of a neurotic prime element.

The treatment of the disease has until lately been almost purely empirical, the two standard remedies formerly recommended for use as a routine practice being alum and belladonna. These drugs have their merits, but their field of usefulness has been more carefully defined in accordance with modern scientific therapeutics, while there are numerous remedies of later discovery that are fast gaining a foothold as either specifics or palliatives when properly used. A good *résumé* of the use of some of these remedies is given by DR. SICARD (*Revue de Thérapeutique Médico-Chirurgicale*, December 1, 1890), who briefly describes the methods of using and the virtues claimed for eight of the remedies whose employment is of recent date. His preference is evidently for antipyrine in frequently-repeated small doses. He denies that it acts both by its antiseptic and antispasmodic properties, and states that it is not a specific. In THE MEDICAL NEWS, December 13, 1890, DR. J. P. CROZER GRIFFITH publishes a paper confirming his former favorable report upon the use of antipyrine, and urges its employment in larger doses than those ordinarily used. Bromoform may be tried in cases in which the spasmodic element is marked and which antipyrine has failed to relieve, although it apparently possesses no advantages over the latter drug.

Among the older drugs employed for their antispasmodic action are belladonna and chloroform. The former of these, which has been used for so long a time with evident advantage against this and all other affections accompanied by spasm, cannot be omitted from the list of efficient remedies, while the place of chloroform may well be taken by its safer and equally-effective congener, bromoform.

In accordance with the view of the purely-reflex origin of the nervous phenomena of the disease many remedies for application to the throat and fauces have been highly recommended, but the exciting cause of the spasm, if it is in reality merely reflex, is probably seated too far down in the respiratory tract for such remedies to reach. Other remedies for topical application have been recommended on account of their anti-microbic action. Of these, resorcin and carbolic acid have been the most generally adopted. With a similar object the continuous inhalation of the fumes of sulphurous acid has been much practised, and possesses the great advantage that the method can be combined with the employment of other remedies, the patient merely sleeping in an apartment which has been subjected to the action of burning sulphur.

Against the catarrhal element we have lately acquired a valuable drug in terpine hydrate, which in the hands of some has given excellent results. This drug, or some of the older and more generally used expectorants, may be employed in selected cases with the addition of alum, the salts of zinc, or nitric acid, if the catarrhal products are in excess.

With such an array of antiseptics, antispasmodics, and expectorants we would seem to need nothing but a specific to complete our armamentarium. Although many of the remedies mentioned have been vaunted as specifics by their most ardent advocates, it is probable that before any such remedy is found we must have more exact knowledge of the true nature of the disease. In Dr. Sicard's article results are mentioned which are truly wonderful in their promptness as recorded by the originators or advocates of the various drugs. That others have been unable to obtain similar results in such a universally-similar disease as pertussis can be attributed either to imperfect observation by the successful or to a faulty carrying-out of the methods by the non-successful reporters. In all likelihood the latter is more frequently the cause of failure, and it should be constantly borne in mind that it is more harmful to make an unfavorable report upon a remedy that has not been *properly* used than to remain inactive in the field of therapeutic research. Probably, as Dr. Griffith remarks in the article referred to, failure to use the remedy in sufficientl-ylarge doses has been the cause of much of the disappointment to those who have been unable to obtain good results from antipyrine in this disease. That none of the drugs so far brought forward are specifics is probably true, but when properly used some of them have a marvellous power to control the spasmodic element, and thereby, indirectly, the vomiting and hæmorrhages that frequently cause an otherwise simple case to assume a dangerous character.

OBSTETRICAL ANTISEPSIS.

THE features of obstetrical teaching that will make the strongest impression on the present era of obstetrical progress are the proper use of antiseptic precautions, and the results for good which have been brought about by a wise application of this principle. From the early work of Semmelweiss—that now represents the true foundation of all the progress that has since been realized in this direction—until the present time, there has been a continual effort made in all parts of the world to improve the results obtained in maternity hospitals, not only in the death-rate, but also in the febrile complications following labor. When epidemics of puerperal fever were common, and the death-rate in lying-in hospitals was truly murderous, that great obstetrician, Semmelweiss, was the first to realize that the trouble arose from the absorption of putrescent animal substances which had been deposited in or about the genital tract of the parturient woman. The precautions he took to combat the terrible death-rate (9.92 per cent.) of the Vienna Obstetrical Clinic were simply those of forbidding the attending physicians to perform autopsies, and requiring everyone who handled the patients to disinfect their hands previously with chloride of lime. Immediately after the institution of those precautions the mortality in his wards fell to 1.27 per cent.

For years the deductions of this much-underrated obstetrician were neglected and scoffed at. However, since the experiments of Pasteur and Lister have been widely studied, the principle of antiseptic cleanliness has been generally accepted and applied to all obstetrical procedures, and, in proportion as this principle has been carefully carried out, the results in different maternities have been improved.

In the *Transactions of the Obstetrical Society of London*, June and July, 1890, ROBERT BOXALL, M.D., contributes an elaborate article on the subject of antiseptic precautions as carried out in the General Lying-in Hospital of London during the last seven years. For several years prior to this time, the hospital was closed on account of the terrible mortality which had attended its service. When the wards were re-opened in 1882, it was under a strict antiseptic *régime*. From July 1, 1882, to April 30, 1884, there were 612 admissions, and the death-rate was only 0.980 per cent. From May 1, 1884, to June 30, 1889, there were 2150 admissions, and, under an increased improvement in the details of treatment, the death-rate fell to 0.418 per cent. During the first period (more than a year and a half) the labors followed by fever from all causes amounted to 83.006 per cent.; during the second period, or until 1889, this was reduced to 40.651 per cent. This rapid improvement is a repetition of the experience of all modernized maternity hospitals. However, there is yet room for great improvement. A death-rate of 0.418 per cent. is about as small as any maternity may expect to attain, but fever following 40.651 per cent. of labors is enormous, and can be readily reduced. In this hospital apparently the same mistake is made that is so often made elsewhere. There seems to be a tendency to adopt the common idea, that if there is good in a little of any given remedy, there must be more good in a great deal of it. When patients are admitted to the hospital "they are immediately dressed in hospital

clothes, and, in all cases in which time will allow, the passages are irrigated with three quarts of antiseptic solution before delivery, the douches being repeated if the labor be prolonged. One or more such vaginal douches at a temperature of 115° F. are invariably given after labor is completed. The vaginal douche at a temperature of 110° F. is employed as a routine measure, night and morning, until the lochia have ceased." Is it not possible to account for at least a part of this large percentage of febrile complications by the too free use of mercurial douches? In Pesth, in a series of cases in which no injections whatever were used, 82.78 per cent. of the patients remained free from fever. In another series of 300 cases in Germany there were 94 per cent. with no fever. In Berlin, in a series of 422 cases, 90 per cent. remained free from fever. In Dresden, Leopold gives the following comparison: Of 1388 deliveries with injections, 17.2 per cent. had fever; of 1136 deliveries with injections and vaginal washings, 20 per cent. had fever; of 1123 deliveries with no injection at all, only 9.7 per cent. had fever. The antiseptic precautions in all these cases were applied to everything which approached the woman, but not to the parturient tract. It was assumed that the infection came from without, and not from within; and the results certainly warrant the conclusion. It would seem, from this, that we are still about where Semmelweiss left us.

The surgeons of the General Lying-in Hospital have found that, as in general surgery, the mercurial salts are the most efficient of the antiseptics. An extended trial of salufer, permanganate of potassium, and carbolic acid was made, but in every instance the mortality- and fever-rate exceeded that which occurred when the salts of mercury were used. From the fact that creolin has not been used in this hospital, it is to be presumed that there was a lack of confidence in its efficiency.

The good results attained in this hospital are further evidence that obstetrical cases can be safely used for teaching purposes. Although students are not admitted to the wards, yet there is a flourishing school of both nurses and midwives attached to the institution.

THE DIAGNOSTIC VALUE OF THE FIBRINOUS ELEMENTS OF THE BLOOD.

IT is a well-established fact that, secondarily at least, the blood partakes in tissue-changes, and becomes more or less altered in constitution. There are strong reasons for supposing that the participations of this fluid in the phenomena of inflammation are not simply those of solution which are generally accepted, but that in such a condition it presents alterations in constitution not only in consequence of its assumption of the products of the cellular changes, but also to aid in the fulfilment of the inflammatory process. These changes are not so much alterations of the red corpuscles, as those variations in the fluid-elements by which the possibility of forming fibrin is increased. With this there probably coëxists numerical alteration in the leucocytes, or anomalies in their size. Such alterations are evidenced, of course, by the greater tendency of the blood to coagulate, and are present in order to bring about in the inflamed area a skeletal formation of fibrin upon which the regenerative changes shall occur. In the days of venesection such a condition, partly described under the term *hyperinosis*, was recognized; but with the gradual disuse of this procedure as a therapeutic measure, the hæmic fault was also allowed to fall into neglect. The microscopists are not entirely inculpable in this neglect of an important feature, since, in this country at least, with the possible exception of a few practitioners of questionable standing, practically no attention is paid to this matter; although there is little doubt that there exist certain quite perceptible differences in the manner of formation and the mode of arrangement of the fibrin in the clotting of blood in a number of different diseases.

According to Hayem, in his classic treatise upon the blood (*Du sang et ses alterations anatomiques*, par Georges Hayem, 1889), Masson recognizes three types of coagula: (1) that in which there exists a very intricate network of rather coarse fibrils with numerous and large accumulations of plaques; (2) that in which the coarse fibrils are present but fail to form so intricate a network, and in which the plaque-masses are not so marked; (3) that in which the network of fibrin is delicate and composed of very fine fibrils, remarkable also for their great numbers. The first of these types is referred by Hayem to such processes as the early stages of fibrinous pneumonia, acute rheumatism, the suppurative inflammations, etc.; the second to the beginning of inflammations of a somewhat diffuse character, and to secondary or symptomatic inflammations; the third to parenchymatous inflammation especially, and in some cases to symptomatic inflammation.

Following in this line, ORIOU (*Archives de Méde-*

cine et de Pharmacie Militaires, October, 1890) claims diagnostic value for the microscopical examination of the fibrinous reticulum of the clot in the following conditions: *la grippe*, acute gastritis, and typhoid fever; pulmonary, pleural, laryngeal, and abdominal tuberculosis, and tuberculosis of the bones and joints; muscular and acute articular rheumatism, acute bronchitis, acute pneumonia; and in localized and diffuse suppurations. In the case of *la grippe*, Oriou states that this fibrinous reticulum becomes apparent in the early days of the affection; that as a rule it assumes the third type of Hayem, although in certain complications it changes to the second; and that it disappears with the disappearance of the fever unless there persist in the febrile state any visceral inflammatory conditions as gastro-intestinal catarrh or bronchitis. The character of the fibrinous reticulum in the blood taken from a case of gastro-intestinal inflammation, as from any other simple inflammation, largely depends upon the intensity of the inflammation, and the value of the phenomenon in these cases is particularly in the separation of a simple process from one of specific character, such as typhoid fever. In the latter disease the blood usually fails to present any fibrinous reticulum for the first seven or eight days and, as a rule, at no stage shows more than an imperfect reticulation.

Generally speaking, the same is true of tuberculosis and other specific processes. In these conditions there is no reticulation save in the presence of pronounced inflammatory complications, the specific process having no tendency to produce the phenomenon.

Of especial value from these considerations must be the determination of the presence or absence, and the character, if present, of the fibrinous reticulum in cases in which the nature of a disease-process located in the gastro-intestinal tract, in the pulmonary system, or in any other portion of the body, is questioned. For example, acute croupous pneumonia presents the most pronounced type of reticulation, of exceeding intricacy and composed of large heavy fibrillæ; a *grippal* pneumonia is apt to present a slight reticulation, one of the delicate forms, corresponding, as a rule, to type three of Hayem; typhoid pneumonia rarely presents reticulation at any period of the process; tubercular pneumonia should show but imperfect reticulation, if any, unless it be accompanied by considerable inflammatory reaction; rheumatism usually presents a marked reticulum in the clot of the first type of Hayem, and is readily separated from other localized painful affections by this peculiarity.

In the nature of things, the existence of such differences in the physiology of the most generally present tissue of the body is probable, and it is remarkable that so little attention has been paid to a subject of such importance. The technique of the examination is not especially complicated or tedious, and the apparatus required is simple. A drop of blood is placed upon a slide and the slide transferred to a moist chamber until coagulation has taken place, a cover-glass having been, of course, placed over the blood. The slide is then removed from the chamber and a delicate process of lavage carried out by dropping on one side of the cover a small quantity of distilled water so that it penetrates the reticulum, and drawing it through the mass by a bit of absorbent paper held in contact with the edge of the cover on the other side. By this means the red and white cells and plaques are removed from the reticulum, bringing it into prominence and permitting study of its characteristics. In this process of lavage a slide carefully and evenly grooved aids in the rapidity of the procedure and prevents in a great degree any damage to the reticulum. After the mass has been thus washed a drop of dye, such as rosaniline hydrochlorate, is substituted for the water and drawn through the mass in the same manner; the excess of dye is washed out with water and the preparation is ready for examination.

There is little to be said in comment. The possibilities in diagnosis are limited, but of such importance in their limitation that the general hesitation at even a tentative employment of the suggestion is inexplicable.

REVIEWS.

EINFUHRUNG IN DAS STUDIUM DER BACTERIOLOGIE. Von Dr. med. CARL GUNTHER, in Berlin. Pp. 244. Leipzig: George Thieme, 1890.

IN 1863, in Delft, Holland, the first recorded observation and recognition of bacteria took place, the observer, Leeuwenhoek, calling attention to his discovery of "animalcules" in the material which collects about the teeth and in various fluids of the body. The organisms were seen by means of a powerful simple lens, which he himself had ground. Since this date, the bulk of the work having been accomplished within the last thirty years, and chiefly in the past decade, our knowledge of these vegetable micröorganisms has grown from a few isolated facts into a science influencing every branch of medicine. Following the development of this science there has grown a vast literature; and the number of

bacteriological text-books is constantly increasing. Few of these are without reason for existence, the rapid strides of our knowledge in this field necessitating the multiplication of books. Of these books, however, few are destined to live beyond the first edition; and still fewer run any serious risks of ever becoming regarded as classics.

While the work of Dr. Gunther's is in no danger of this last possibility, it is far above the average of the numerous technical and descriptive bacteriological works. It is divided into three sections, the first treating of the general methods of bacterial technology, the second dealing descriptively with the pathogenic varieties, and the third with the non-pathogenic forms. Throughout the text there is to be noted an excellent feature in the recognition of the historical details of the various bacteria and methods, a feature almost invariably wanting in other works upon this subject. The references in the text are numerous and notably up to date, but it must be added that they are also notable because of their close adherence to German authorities. This same feature is quite as well marked in the recognition of the precedence for German investigators over those of other nations. These objectionable peculiarities, for such a characterization seems warrantable, may be pardoned, however, in view of the unquestioned success of the German nation as scientific investigators.

What may cause disappointment in this work to those who seek a bacteriologist's *vade mecum* is, that the writer has not recognized many of the media and methods employed in staining and culture, usually mentioning but a few of the well-tried ones. These are, however, fully and clearly presented. While this may be regarded as an excellence in the general portion of the book, in the descriptive portion (where every element should be mentioned as a possible factor in isolation) it must be looked upon as a serious omission. For example, the description of so important a microörganism as Eberth's bacillus of typhoid fever has received scarcely more than a brief paragraph, although two or more pages of text are devoted to the consideration of its history and the experimental researches touching upon its influence in the production of disease. In this case no ideas of mensuration are given. The same criticism may be made regarding other germs, especially those of the non-pathogenic varieties.

In relation to the many excellent features of the book as an introduction to bacteriology, these faults do not have by any means the prominence which might seem to attach to them. The clearness of presentation, the fulness of the historical and experimental considerations, the simplicity of plan, and the excellent photomicrographic plates, are sufficient to prevent the book from being seriously marred by the faults mentioned.

CORRESPONDENCE.

LONDON.

Mr. Jonathan Hutchinson on the Relationship of Lupus to Tuberculosis.

A FEW days ago Mr. Jonathan Hutchinson delivered an important lecture on "The Nature of Lupus, with especial Reference to its Relation to Tuberculosis," at the examination hall of the College of Physicians and Surgeons. It is, I believe, the first time that such a use has been made of the building, and the occasion was the commencement of the second London post-graduate course, in which, from its beginning, Mr. Hutchinson has taken great interest. The audience, which numbered about one hundred persons, included Sir Joseph Lister and Sir Andrew Clarke.

At the commencement of the lecture Mr. Hutchinson demonstrated the prominent features of the disease, as exemplified in a young woman whom he brought before his hearers, and pointed out how the disease tended to attack the areas especially concerned in flushing or blushing, and those much exposed, for example, the cheeks and tip of the nose. Premising that he approached his subject solely from a clinical point of view, he said that the first thing to consider was whether the typical form of lupus vulgaris is always of bacillary origin. There are two possibilities to be borne in mind: first, the lupus-process may be always due to the implantation of the parasite bacillus in the tissues, or second, the process may originate as a variety of inflammation, induced by any one of many local causes of irritation and nutritional change. He at once expressed his own leaning to the view that it is highly improbable that true lupus is always the result of contagion, and that it usually begins in inflammatory action made peculiar by the special proclivities of the individual. In his opinion, lupus is not always a well-defined and easily-recognizable disease, and no symptom or set of symptoms will enable one to recognize with certainty all cases of lupus, and to determine what should and what should not be included under that name. His definition of the lupus-process was given in the following words: "Whenever a chronic inflammation of skin or of mucous membrane, not due to syphilis, shows a persistent tendency to spread at its edges, to produce satellites near it, and to leave a condition of scar behind it, such a process is for me one of lupus. In a few cases the production of satellites may be omitted and the patch may remain absolutely single, but its infective edges and the resultant scar are essential. No form of lupus is without them, although it must be admitted, perhaps, that in a few the demonstration of the scar may be difficult. There is another condition which when present is to trained minds definitely diagnostic of lupus. I refer to the presence beneath a thinned layer of epidermis of a deposit or growth of semi-translucent granulation-material, often in considerable thickness. This 'apple-jelly-like' deposit, as it has been named, is, when present, perfectly characteristic of common lupus." Amongst minor features of the lupus-process he mentioned that if the surface does not ulcerate it is usually covered with white papery flakes of epidermis which, however, do not fall off; if the patch is ulcerated a dried crust forms, which, when removed, leaves a bleeding surface.

Lupus vulgaris is most common on the tip of the nose, the next most frequent seat being the cheek. It is not uncommon on the limbs but very rare on the trunk. The patches are never symmetrical. Though occasionally seen in children, it does not often develop until after the period of puberty. The lymphatic glands, lungs, bones, joints, and intestines, are never affected.

Nothing is less common than to see a lupus-patient develop phthisis. The most typical forms are often coincident with good general health, and with the absence of any family history of tuberculosis. He believes that lupus is as closely related to cancer as to tuberculosis, and that an unbiased statistical investigation would show that the latter association is not so frequent as is commonly assumed.

Reminding his hearers that syphilitic symptoms could imitate lupus, he said that since syphilis in its tertiary stage is only a chronic infective inflammation, deriving its peculiarities from the antecedents of the patient, and having nothing whatever to do with tuberculosis or bacilli, it is reasonable to suppose that lupus, which so exactly resembles it, might also be a process of chronic inflammation made peculiar by the vital proclivities of the patient. If lupus were of bacillary origin he thought it remarkable that in gland struma the skin does not assume a lupus-state and that the glands never become involved in lupus. Of primary tubercular ulceration of the skin he has had no personal experience but tubercular ulceration of mucous membranes presents characters quite distinct from those of lupus in that situation.

In conclusion he said, "I may own that the sum of the evidence seems to me much in favor of the belief that lupus is a specialized form of chronic inflammation rather than the result of infection. In suggesting this I am well aware that it is merely a negative conclusion, which is liable to be overthrown at any time by the accumulation of positive evidence. It may be that in the future the presence of bacilli in lupus-products may be demonstrated in earlier stages, and much more constantly than has yet been the case. The results of Koch's injection-treatment may possibly force us to believe that there is something about lupus which connects it far more closely with tuberculosis than I have admitted."

ABSTRACTS FROM "THE PICTURE OF PHILADELPHIA," ETC.[1]

IN an extremely interesting historical and statistical account of the city of Philadelphia, published in 1811,[2] with the keen eye and tastes of a physician, Dr. Mease has recorded many facts of deep interest to the medical historian. The few following extracts from this book, although loosely strung together, present an excellent picture of medicine in Philadelphia in the first decade of this century:

Philadelphia at that time consisted of nine original streets running east and west from the Delaware to the Schuylkill, and thirteen streets crossing these at right angles. The streets running east and west were named, with the exception of High (Market) street, for the native trees: Vine, Sassafras (Race), Mulberry (Arch), High (Market), Chestnut, Walnut, Spruce, Pine, and Cedar (South). The territory immediately outside these boundaries was called the "Liberties," as the people there were out of the city jurisdiction.

The population in 1810 was 53,722,[1] of whom 2 were slaves. Dr. Mease attributes the great increase in population over that of 1790 (28,522, of whom 193 were slaves), in spite of five epidemics of yellow fever, to the number of marriages and the inducements to immigration, and to a general improvement of the public health, due in part to the successful efforts of Dr. Rush in inducing the Legislature to arch over the Dock-street creek, which had become filled with mud, unfit for navigation, and a receptacle of an immense mass of animal and vegetable offal matters which poisoned the air by their exhalations. After this creek was thus covered in, he remarks that typhus fevers generally, and the fatal cholera, or bowel complaints of little children, diminished so evidently as to strike even common observers. Improvement was also due to "greater attention to cleanliness, to the institution of a dispensary for the poor, and to improvements in the healing art."

He remarks of the climate that a considerable change had taken place, the winters being less uniformly cold, the Delaware for many years past not affording the diversion of skating for more than two weeks at a time, and seldom so long. In the winter of 1779–80 it was frozen for three months, and an ox was roasted on the ice. The rain, in most parts of the United States, he says, falls in greater torrents than in Europe, and we know but little of those "fine, gentle showers" which, Volney says, "it is the fashion for people to go out to enjoy without umbrellas, and to get themselves wet to the skin!"

We read that "the death-rate is diminished by the very great improvements in the science of medicine and surgery. Many diseases now yield to the power of the healing art that formerly defied it. Thirty years since, the disease from drinking cold water in summer when the body was heated with exercise, the lockjaw, the croup or hives, mania, were seldom or never cured; but, at present, they are very rarely fatal when early assistance is given. The first-named disease is peculiar to the United States, and with regard to the last two it is asserted on good authority that the success in Philadelphia is infinitely greater than in Europe. Even the consumption, formerly a hopeless disease, has yielded, in numerous cases in this city, to the early and judicious application of medicine. The free use of wine in low fevers, of mercury, bark, opium, and the lancet, and warm and cold baths, has increased the empire of medicine over various diseases."

He further states that the character of our diseases is inflammatory, owing to the variable climate, and the general use of animal food and alcoholic stimulants. Hence the lancet is oftener required than the stimulating draught —to the astonishment of the European physician hearing of the depleting system of the United States and especially of Philadelphia.

An improvement, however, was taking place, due, among other things, in the author's estimation, to the substitution of malt liquors for punch, and to the use of flannel or muslin next to the body expelling the "dry gripes," formerly a fatal disease in Philadelphia. Important, also, says he, is the universal use of umbrellas,

[1] Read before the Historical Society of the Johns Hopkins Hospital, by Howard A. Kelly, M.D.

[2] By James Mease, M.D. Philadelphia, B. & T. Kite, 1811, pp. 376.

[1] The whole population of the city and county of Philadelphia in 1810 was 111,210, while that of New York, embracing the entire island, was 96,372.

and the increased use of high-crowned hats, lessening diseases arising from the operation of the sun.

The mortality record in 1811 was made up by compelling the sextons of all churches to make returns of their burials. After stating the mortality, he says: "If the population of Philadelphia, as being greater than that of New York, be taken into consideration, the difference in favor of Philadelphia will be considerably increased." We read that the air of New York was more irritating, and persons who had spat blood in New York were entirely free from any pulmonic affection in Philadelphia.

There is an interesting account of the foundation of the Pennsylvania Hospital, first located on Market Street, west of Fifth. There were in this building, in all, 130 wards and rooms, of which 86 were apportioned to the lunatics and 23 to the sick and wounded. The lunatics being separated from the sick by the centre house, the latter were not incommoded by their noise. The library then contained 3000 volumes of choice medical books.

An amputation of a limb was not to be performed in the hospital unless a patient consented to it, nor then unless three physicians agreed.

"The present [in 1811] physicians are Dr. Rush, Dr. Parke, Dr. Wistar, Dr. Physick, Dr. Barton, Dr. Hartshorne, and the physician to the lying-in department, Dr. Thomas C. James."

In speaking of the University of Pennsylvania, he says: "In the year 1764 the foundation of the first medical school in America was laid by a course of lectures upon anatomy, which was delivered by the late Dr. William Shippen. His pupils amounted to ten. He was appointed professor of that branch, in the following year, by the trustees, and Dr. John Morgan, professor of the institutes of medicine. Both these gentlemen had graduated at Edinburgh, and had previously agreed to attempt the establishment of a medical school on their return. In 1768 Dr. A. Kuhn was appointed professor of botany, and in 1769 Dr. B. Rush was appointed to the chemical chair; Dr. T. Bond at the same time gave clinical lectures in the Pennsylvania Hospital. After bitter internal dissensions, in 1791 the seminary was erected now called the University of Pennsylvania, with the addition of chairs of natural history, law, and the German language."

The professors in the medical school were: Caspar Wistar, Jr., M.D., Professor of Anatomy; Benjamin Rush, M.D., Institutes and Practice of Physic and Clinical Practice; Philip Syng Physick, M.D., Professor of Surgery; John Syng Dorsey, Adjunct Professor of Surgery; Dr. Benjamin Smith Barton, Professor of Materia Medica, Botany, and Natural History; T. C. James, M.D., Professor of Midwifery; and John Redman Coxe, M.D., Professor of Chemistry.

For the loan of this interesting work I am indebted to my friend Dr. W. H. H. Githens.

NEWS ITEMS.

Lister's Work.—Lister's work since he took his first degree in 1852, has been of a character to command the respect and admiration of the scientific world. Receiving the first prizes in botany and anatomy when he passed the M. B. examination, he won the gold medal and the scholarship in surgery in the final examination. His papers on the minute anatomy of the skin, the physiology of the lacteal current, the contractility of the iris, the microscopic anatomy of involuntary muscular fibre, the relations of the inhibitory system to the visceral nerves, the regulation of arterial contraction by the nervous system, the early stages of inflammation, the coagulation of the blood, etc., stamped him at once as an original investigator of the first rank, and, as one of his biographers says, "would have sufficed to make his career memorable if he had never applied antiseptic measures to the treatment of disease." I have heard Professor Louis Agassiz years ago and later Professor Joseph Leidy say that, viewed from the standpoint of abstract science, his work had been of the very highest order and the appreciation of his labors by the best minds in our own profession has been enthusiastic and almost universal. Nearly every great surgeon in the civilized world has put on record his admiration for Lister's teachings, his acceptance of the general principles involved and his sense of almost personal obligation to the author of the antiseptic theory.

That Mr. Tait should speak of such a man as having "lived in the clouds of his spray for the last twelve years," as "wanting in logic," having "crude notions of logical definition," making "illogical blunders," "falling away from his own faith," promulgating an "absolute and ludicrous logical error," etc., and should make a boast of having "laughed at" and "ridiculed" him and his doctrines and disciples, is, it seems to me, evidence of his unfitness by temperament or training (or from lack of the latter) for the serious discussion of broad surgical principles. I am quite sure that the vast majority of general surgeons will be found to have no sympathy with either his views or his manner of expressing them, and it is a relief to find that in his own special line there are operators of equal eminence who repudiate both. In an address on "Abdominal Surgery, Past and Present," recently delivered before the Medical Society of London, its president, Mr. J. Knowsley Thornton, said: "I am not ashamed still to use the spray and all the precautions which have advanced my results in ovariotomy to 1.88 per cent. mortality (as against Bantock's 4 and Tait's 3.3 per cent.), and I find increased practice and a steady adherence to methods which have yielded me good results in the past increase in like ratio my success in all abdominal operations. Every operator of prominence improved his results enormously as soon as he adopted Listerism; then, having learned how to be surgically clean, he has found for himself ways of attaining this end with more or less success by methods differing from those of Lister. The sum and substance of it all is, that if we never had Lister to teach us true cleanliness, we should never have used antiseptics, flushings or drainage-tubes to attain it." —DR. J. WILLIAM WHITE, in the *Annals of Surgery*, January, 1891.

DR. NORMAN BRIDGE, Professor of Clinical Medicine and Physical Diagnosis in Rush Medical College, Chicago, has been compelled by ill-health temporarily to abandon his professorship and practice. He has gone to Los Angeles, California.

Compulsory Vaccination in Egypt.—By a Khedival decree which was published in the *Official Journal* of

Cairo on December 17, 1890, the vaccination of infants is made obligatory throughout Egypt and its dependencies Every child is to be vaccinated within three months from its birth, except in case of illness, when a medical certificate of postponement is to be obtained. Arrangements are made for the gratuitous performance of the operation, and the duty of securing the vaccination is imposed on the child's father or guardian under pain of a fine or imprisonment. The decree went into operation on its publication December 17th as regards natives, but three months' grace is allowed to foreigners. —*British Medical Journal*, January 3, 1891.

New Jersey State Medical Examination.—The following were the questions of the Medical Examining Board of New Jersey at the meeting of January 8 and 9, 1891:

SECTION I. *Materia Medica and Therapeutics.*
(William L. Newell, M.D., Examiner.)

1. What medicines are incompatible with cinchona?
2. What preparations of quinine are best adapted to subcutaneous use?
3. Give a test for iodide of potassium?
4. What is chloroform? What are its physiological effects?
5. What is the treatment for an overdose of aconite?
6. What are the vegetable acids?
7. What are the physiological effects of the salts of lead?
8 What are the physiological effects of mercury and its salts?
9. Write a prescription containing a salt of lithia, and give the pathological condition intended to be relieved.
10. What are the officinal preparations (and dose of each) of opium and its alkaloids?

SECTION I *A. Homœopathic Materia Medica and Therapeutics.* (A. M. Worthington, M.D., Examiner.)

1. Explain methods of preparing medicines by attenuation, solution and trituration, by the decimal system.
2. Give a brief botanical description of gelsemium sempervirens.
3. What are the laryngeal symptoms of hepar sulphuris?
4. Name the remedies of greatest value in acute articular rheumatism.
5. What are the lung symptoms of phosphorus?
6. Give the heart symptoms of convallaria majalis.
7. Name the indicated remedies for parenchymatous tonsillitis—primary and suppurative stages.
8. Describe the characteristic diarrhœa of croton tiglium.
9. Differentiate the skin symptoms of thuja occidentalis and graphites.
10. Give the abdominal symptoms of veratrum viride.

SECTION II. *Obstetrics and Gynecology.*
(Dr. Brown, Examiner.)

1. What is natural labor?
2. How many stages in a natural labor, and how are they divided?
3. Give the treatment of the third stage of a natural labor.
4. What are the functions of the placenta?
5. Give indications for and methods of inducing premature labor.
6. Give the treatment of abortion.
7. What are the differences between the male and female pelvis?
8. Give the symptoms and treatment of puerperal eclampsia.
9. Give the symptoms and treatment of uterine polypi.
10. Give the causes, symptoms, and treatment of rupture of the perineum.

SECTION IV. *Physiology.*
(D. R. Atwell, M.D., Examiner.)

1. What is a proximate principle? Give classification of the same.
2. What are the functions of the retina and iris?
3. What is the function of the placenta?
4. Give the normal surface-temperature of the body, and name influences which produce variation from the normal.
5. What forces keep the blood in circulation?
6. For what do the lacteals and mesenteric veins serve?
7. Give the percentage composition of human milk.
8. For what does the skin serve?
9. Give the physiological properties of the pneumogastric nerve. Over what organs does it preside?
10. Describe the excretory process of the kidneys.

SECTION V. *Anatomy.*
(A. Uebelacker, M.D., Examiner.)

1. Describe the humerus.
2. Describe the shoulder-joint.
3. Enumerate the muscles of the acromial, anterior and posterior scapular regions.
4. Describe the patella and muscles attached to it.
5. Give origin, course, and divisions of right carotid artery.
6. Describe the external jugular vein.
7. Describe the vertebral artery.
8. Describe the radial artery.
9. Describe the ophthalmic nerve.
10. Describe the tongue.

SECTION VI. *Surgery.*
(Hugh C. Hendry, M.D., Examiner.)

1. State the recognized fractures and dislocations of the head of the humerus, and give the differential diagnosis of each.
2. Give symptoms, diagnosis, and treatment of backward dislocation of the elbow.
3. State the recognized fractures of the head of the femur, and give the differential diagnosis.
4. Give the immediate symptoms and remote effects of a severe concussion of the spine in the lumbar region.
5. Treatment of wounds: Describe the antiseptic methods as at present employed. Give the names of several antiseptics and the manner of using them.

SECTION VII. *Chemistry.*
(Eugene Tiesler, M.D., Examiner.)

1. Give three tests for sugar in urine.
2. What is the difference between slacked and quick lime?

3. Give tests for arsenic in solution.

4. By what methods are volatile oils obtained, and how do they differ from fixed oils?

5. What is alcohol? How is it produced?

6. In what form is mercury present in the unguent. hydrarg. ciner.

7. Define bismuth subnitrate. How is it prepared? Give properties.

8. What is spirit mindereri? How do you prepare it?

9. What is oil of vitriol?

SECTION VIII. *Histology, Pathology, and Diseases of the Eye and Ear.* (H. G. Wagoner, M.D., Examiner.)

1. Describe muscular tissue.

2. Describe nerve tissue.

3. Give the lesions characteristic of typhoid fever.

4. Give the pathology of arsenical poisoning.

5. Give pathology of acute, chronic, and tubercular meningitis.

6. Give the pathology of lupus.

7. Describe hypertrophy of the heart, without and with dilatation.

8. Give symptoms and treatment of furuncle of the external auditory canal.

9. Give causes, symptoms, and treatment of purulent ophthalmia.

10. Explain exophthalmic goitre, symptoms and causes.

SECTION IX, *Hygiene and Medical Jurisprudence.* (A. H. Worthington, M.D., Examiner.)

1. Name the diseases that may be caused by drinking impure water.

2. What method would you advise to destroy the disease-producing germs that impure drinking-water may contain?

3. What is the normal quantity of carbon dioxide in the atmosphere, and what proportion in the air is sufficient to cause sudden asphyxia?

4. What is the difference between an antiseptic, a deodorant, and a disinfectant?

5. Names the acids, acetic, boric, carbolic, and salicylic, in the order of their strength as germicides.

6. What are the ordinary signs of death?

7. How soon after death is the best time to make a post-mortem examination for medico-legal inquiry?

8. How would you distinguish an ante-mortem bruise from a post-mortem ecchymosis?

9. State the chief distinctive marks to determine the sex and probable age of a human skeleton.

10. How would you diagnose alcoholic coma from apoplexy, or an injury to the brain?

Arsenic in Commercial Acids.—BUCHNER calls attention to the fact that commercial hydrochloric and sulphuric acids contain large quantities of arsenic. On examination in 200 pounds of sulphuric acid were found 4 ounces of arsenious acid and nearly four times as much arsenic was found in a sample of hydrochloric acid.—*American Journal of Pharmacy*, February, 1891.

OFFICIAL LIST OF CHANGES IN THE STATIONS AND DUTIES OF OFFICERS SERVING IN THE MEDICAL DEPARTMENT, U. S. ARMY, FROM FEBRUARY 3 TO FEBRUARY 9, 1891.

By direction of the Secretary of War, JAMES G. MERRILL, *Captain and Assistant Surgeon*, is relieved from duty at Fort Reno, Oklahoma Territory, and will report in person, at the earliest practicable date, to the Surgeon-General of the Army, in this city, for duty in his office.—Par. 5, *S. O. 29, A. G. O., Washington. D. C.*, February 5, 1891.

DAVIS, WILLIAM B., *Captain and Assistant Surgeon.*—The leave of absence for seven days granted, by Orders No. 2, Fort Preble, Maine, February 4, 1891, is hereby extended twenty-three days, with permission to apply to the Adjutant-General of the Army for a further extension of one month.—Par. 2, *S. O. 22, Headquarters Division of the Atlantic, Governor's Island, New York*, February 5, 1891.

CHAPIN, ALONZO R., *Captain and Assistant Surgeon.*—Is granted leave of absence for one month, with permission to apply to the Adjutant-General of the Army for an extension of one month, Fort Yates, North Dakota.—Par. 3, *S. O. 17, Department of Dakota, St. Paul, Minnesoto*, January 31, 1891.

By direction of the Secretary of War, CALVIN DE WITT, *Major and Surgeon*, is relieved from duty at Fort Hancock, Texas, and will report in person to the commanding officer, Fort Sam Houston, Texas, for duty at that station.—Par. 1, *S. O. 27, A. G. O., Washington, D. C.*, February 3, 1891.

By direction of the Secretary of War, WILLIAM STEPHENSON, *Captain and Assistant Surgeon*, will proceed, without delay, from Columbus Barracks, Ohio, to Fort Wayne, Michigan, and report in person to the commanding officer of that post for temporary duty, and upon completion thereof will return to his proper station—Par. 13, *S. O. 23, A. G. O., Washington, D. C.*, January 28, 1891

OFFICIAL LIST OF CHANGES OF STATIONS AND DUTIES OF MEDICAL OFFICERS OF THE U. S. MARINE-HOSPITAL SERVICE, FOR THE FIVE WEEKS ENDING FEBRUARY 7, 1891.

BAILHACHE, P. H., *Surgeon.*—Granted leave of absence for seven days, January 12, 1891.

PURVIANCE, GEORGE, *Surgeon.*—To proceed to Pittsburg and Erie, Pa.; Cleveland and Toledo, Ohio; Detroit, Mich.; and Buffalo, N. Y., as inspector, December 29, 1890.

CARRINGTON, P. M., *Passed Assistant Surgeon.*—Granted leave of absence for seven days, January 16, 1891.

GEDDINGS, H. P., *Assistant Surgeon.*—To report in person to the Supervising Surgeon-General, January 16, 1891. Detailed for special duty, port of Georgetown, D. C., January 19, 1891.

STURGEON, W. G., *Assistant Surgeon.*—To proceed to New Orleans, La., for temporary duty, January 6, 1891.

SAWTELLE, H. W., *Surgeon.*—Detailed as a member of the Board, Revenue-Marine Service, January 26, 1891.

AUSTIN, H. W., *Surgeon.*—Detailed as Chairman of Board for Physical Examination of Officers of Revenue-Marine Service, January 28 and February 6, 1891.

PETTUS, W. A., *Passed Assistant Surgeon.*—Detailed as Medical Inspector of Immigrants, Port of Boston, Mass., January 29, 1891.

MAGRUDER, G. M, *Passed Assistant Surgeon.*—Detailed as Recorder of Board for Physical Examination of Officers of Revenue-Marine Service, January 28 and February 6, 1891.

KINYOUN, J. J., *Passed Assistant Surgeon.*— Detailed for special duty at Berlin, Germany, January 26, 1891.

GROENEVELT, J. F., *Assistant Surgeon.*—To proceed to Cape Charles Quarantine for temporary duty, February 7, 1891.

THE MEDICAL NEWS *will be pleased to receive early intelligence of local events of general medical interest, or of matters which it is desirable to bring to the notice of the profession.*

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